

WASTEWATER OPERATOR CERTIFICATION GUIDE

Updated 2024

Illinois Environmental Protection Agency
Division of Water Pollution Control
Wastewater Operator Certification Guide

The purpose of this guide is to provide information about the wastewater operator certification program. The Wastewater Operator Certification Regulations can be found in 35 Illinois Administrative Code Part 380. For ease of use, this guide is divided into the following sections:

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FAQ's (Frequently Asked Questions)

1. Is the wastewater operator certification program mandatory or voluntary?

The **wastewater operator certification program** is a **mandatory** program. Each wastewater treatment facility in Illinois is required to be operated by a wastewater operator who is certified at or above the certification level required for the treatment facility. The certification program for **collection system operators** is voluntary. A certified collection system operator may be required by a permit.

2. How are wastewater treatment facilities classified in Illinois?

Wastewater treatment facilities are classified as either domestic or industrial facilities.

Municipal wastewater treatment facilities are classified in one of four groups as follows:

- Group 4 Lagoon treatment systems. Group 4 facilities require a wastewater operator certified at the Class 4 or higher level (Class 3, Class 2, or Class 1).
- Group 3 Fixed film processes and Imhoff tank systems with a design average flow (DAF) of less than 1.0 MGD, and all primary treatment systems. Group 3 facilities require a wastewater operator certified at the Class 3 or higher level (Class 2, or Class 1).
- Group 2 Activated sludge systems with a design average flow (DAF) of less than 1.0 MGD. Group 2 facilities require a wastewater operator certified at the Class 2 or higher level (Class 1).
- Group 1 All domestic wastewater treatment systems 1.0 MGD DAF or more, excluding lagoon systems and primary treatment systems. Group 1 facilities require a wastewater operator certified at the Class 1 level.

Group K Industrial wastewater treatment facilities require Class K certified wastewater operators. Group K facilities shall consist of industrial wastewater treatment works, pretreatment works, domestic wastewater treatment works owned and operated by industries, and spray irrigation that is collected and discharged.

3. What are the wastewater operator certification levels available in Illinois?

Municipal: Class 4 (lowest level)
 Class 3
 Class 2
 Class 1 (highest level)

Collection System Operator

Industrial (Class K): Facility-Specific or General (Water Remediation)

4. What are the eligibility requirements for each certification level?

Class 4: 1 year wastewater operating experience **and** high school education or equivalent

Class 3: 2 years wastewater operating experience **and** high school education or equivalent

Class 2: 4 years wastewater operating experience **and** high school education or equivalent

Class 1: 6 years wastewater operating experience **and** high school education or equivalent

Class K: Active supervision and/or operation of an industrial wastewater treatment facility
and high school education or equivalent

Collection System Operator: 1 year collection system operating experience **and** high school
education or equivalent

All applicants must be able to read and write in English

5. Are there any substitutions that can be used to help satisfy the eligibility requirements?

Yes, For Class 1 applicants, minimum of 3 years hands-on with maximum credit of 2 years of wastewater training course/college, maximum of 1 year wastewater specific college training program that includes operation, and maximum of 1 year each of non-wastewater courses, and lab, public water supply, or collection system experience. All must total 6 years.

Class 2 applicants must have 2 years minimum of hands-on experience with maximum credit of 1 year of wastewater training course/college, maximum of 1 year wastewater specific college training program that includes operation, and maximum of 1 year each of non-wastewater training, and lab, public water supply, or collection system experience. All must total 4 years.

Class 3 applicants must have 1 year minimum of hands-on experience and maximum credit of 6 months of wastewater training course/college and maximum, maximum of 1 year wastewater specific college training program that includes operation, maximum of 1 year of non-wastewater training, and maximum of 6 months lab, public water supply, or collection system experience. All must total 2 years.

Class 4 applicants must have 6 months minimum of hands-on experience and maximum credit of 3 months of wastewater training course/college, maximum of 1 year of wastewater specific college training program that includes operation, and maximum of 3 months lab, public water supply, or collection system experience. All must total 1 year.

For collection system operator applicants, must have 6 months minimum of hands-on experience and maximum credit of 3 months of training courses/college or 3 months of lab or public water supply experience. All must total 1 year.

6. What is a wastewater operator?

A wastewater operator is a person who regularly makes recommendations or is responsible for process control decisions at a wastewater treatment facility. The term does not apply to persons whose duties are limited solely to laboratory testing or maintenance, or to other persons who exercise general or indirect supervision only.

7. What is wastewater operating experience?

Wastewater operating experience is time spent performing the hands-on operational duties of a wastewater treatment works operator, which includes direct hands-on physical operation of wastewater treatment equipment and/or wastewater treatment processes, direct active field supervision of wastewater treatment equipment and/or wastewater treatment processes, and/or direct and active involvement in process control decisions for wastewater treatment processes. Wastewater operator experience may be acquired only in municipal wastewater treatment facilities.

8. What does NOT count as hands-on wastewater operating experience?

Public works, street maintenance, meter reading, operating a Vactor truck, sludge hauling/handling and/or application, janitorial, grounds keeping, collection systems and/or drinking water operations, laboratory testing, electrical and/or maintenance mechanic work.

9. What is related experience?

Related experience is experience operating collection systems or drinking water supplies or laboratory or maintenance experience at a wastewater treatment facility. Partial credit toward eligibility will be given once hands-on wastewater operating experience is obtained.

10. What is a wastewater course?

A wastewater course is a course that covers one or more aspects of wastewater treatment such as wastewater collection, treatment, operations, maintenance, or management from an accredited college, university, technical/vocational and trade school or training provider that is approved by the Agency. Credit will be given based up the number of contact hours of the course. The amount of credit that may be given for wastewater courses is dependent on the level of certification being sought. The maximum credit for wastewater courses per certification level is given below.

<u>Certification Level</u>	<u>Maximum Credit for Wastewater Courses</u>
Class 1	24 months
Class 2	12 months
Class 3	6 months
Class 4	3 months

11. How is credit applied if my job duties consist of both wastewater operating experience and related experience?

If your job duties consist of both wastewater operating experience and related experience, credit is assessed based on the percentage of time spent performing each type of duties.

12. How many hours per week must be worked to be considered full-time and/or part-time?

30 hours or more per week is considered full-time employment and may be given full credit toward eligibility determination. Length of work experience can also be provided in hours, instead of months, or in cases of considerable overtime worked. In these instances, 400 work hours = 3 months.

13. How often and where are wastewater examinations offered?

Examinations are offered every month at four sites around the state including the Des Plaines Regional office, Springfield, Illinois EPA Headquarters, Marion EPA Regional Office, and at ERTC in Edwardsville associated with SIU-E. Additional special exams may be offered at conferences. Please check the Illinois EPA website for the current examination calendar.

14. How do I obtain wastewater certification?

The necessary steps to become certified are:

1. Obtain a score of 70 on a certification examination;
2. Once the minimum required experience is obtained, submit a completed application for certification to the wastewater Operator Certification Unit. Applications are available from the Operator Certification Unit or on the Illinois EPA [website](#). Application review time is up to 90 days at which point the applicant is sent either a certificate or a denial letter.

15. To become certified at a particular level, must I work up to that level by passing the examinations for all of the lower certification levels?

No, you may take any level of examination. You do not have to pass the lower level examinations first; however, you must pass the level of exam that coincides with the level you will be applying for.

16. How many questions are on each exam?

The Collection Systems, the Class 4, Class 3, Class 2 and the Class 1 exam have 100 questions each. The industrial Class K (facility-specific) exam has a total of 15 questions, 5 multiple choice and 10 short answer/essay. The industrial Class R (general) exam has a total of 14 questions, 7 multiple choice and 7 short answer/essay.

17. If I fail an examination, how long must I wait to retake it?

There is no minimum period you must wait before you can retake an examination. Once you have received your examination results and have a valid, unused Letter of Admission you may re-take the exam.

18. Can I schedule to take an examination for the same certification level on more than one examination date?

No, you may only schedule for one examination date and location at a time. If you are scheduled for an examination, you may not schedule to take the same examination again until after you receive your examination results notification letter. If you are scheduled for an examination and find you will not be able to attend as planned, you should contact the Operator Certification Unit to change your scheduled examination date.

19. Can I just show up at an examination site and take an examination?

No, you must have a valid Letter of Admission and be on the schedule. All scheduling for examinations is done in advance on a first-come first-served basis through the contact information listed on the Examination Schedule.

20. Can I take a certification examination before I meet the eligibility requirements for that certification level?

Yes, you may take any level of certification examination.

21. What is an Operator-In-Training?

If an applicant passes the examination with a minimum score of 70, the applicant will be considered an Operator-In-Training at that certification level. Upon completing the remaining requirements, the applicant can apply for full certification at that level. The applicant's score and Operator-in-Training status can remain effective for a period of 5 years from date of examination. If the applicant decides to receive a different certification level, an examination at that level must be taken.

22. Can an individual with an Operator-In-Training certificate be considered as the properly certified operator for a wastewater treatment facility?

No, the properly certified operator for a particular wastewater treatment facility must be certified at a level equal to or higher than the certification level required for that facility. An Operator-In-Training does not meet this requirement.

23. Does the properly certified wastewater operator need to be present at the wastewater treatment facility all the time that it is in operation?

The properly certified operator must exercise direct and active field supervision of the wastewater treatment facility. Situations will dictate whether or not the physical presence of the properly certified operator is required on site. However, in all situations, it is expected that the properly certified operator have sufficient knowledge of the treatment facility to handle any situation expeditiously and correctly.

24. What is the difference between the general Class R and the facility-specific Class K certificates?

The general Class R (Water Remediation) certificate is intended only for treatment or pretreatment facilities which treat groundwater contaminated with gasoline, diesel fuel, jet fuel, fuel oil, and/or kerosene. Facilities treating groundwater contaminated with other substances, such as solvents, require facility-specific Class K certification. An operator who holds Class R certification may operate any treatment or pretreatment facility in Illinois which treats groundwater contaminated with gasoline, diesel fuel, jet fuel, fuel oil, and/or kerosene.

A facility-specific Class K certificate is issued for the operation of the specific industrial wastewater treatment or pretreatment facility for which the operator wrote the examination. The operator's certification is based on a specific location and/or permit. If an industrial facility modifies the existing treatment or pretreatment process, the Class K operator must re-take and pass the Class K examination for the modified process.

25. If I hold a municipal certification, such as a Class 1, can I operate an industrial facility without taking a Class K exam?

No, municipal and industrial wastewater treatment works have different operating requirements. Industrial facilities require a facility-specific Class K operator certified for operations at that specific facility. (See Item #24 above.)

26. How long is a wastewater certificate in effect? Do wastewater certificates have to be renewed?

Class 1 – 4 certificates are valid for 3 years. Before July 1 of the year of certificate expiration, the operator may apply for renewal by submitting the Agency issued Renewal Form. If all continuing education units are met at the end of the 3-year period, renewal will be granted. If the operator fails to renew, the operator may request restoration with proof of training within 2 years of expiration date. If the operator fails to do so, the operator must retake the certification examination for the desired level of certification and re-apply for full certification.

Class K and R certifications are valid for 5 years. There is no renewal process. Operators must re-take and pass the examination.

27. Are there any fees associated with wastewater operator certification?

There are no fees associated with wastewater operator certification at the present time.

28. Is there any continuing education requirement associated with wastewater operator certification?

Yes. Class 1 and 2 operators must complete 30 hours (minimum of 20 technical hours) every 3 years. Class 3 and 4 operators must complete 15 hours (minimum of 10 technical hours) every 3 years. Collection system certificates do not require any CEU hours and have no expiration.

Technical training may include but not limited to:

Activated sludge	Aeration	Backwash filters
Chem addition	Chlorinators	Clarifiers
Collection Sys.	Digesters	DMRs
Disinfection	Electrical Maint	Fixed Film
Imhoff tanks	Instrumentation	Intermittent sand filters
Lab procedures	Lagoons	Math
Maintenance	Operations	Oxidation ditches
Package aeration	Preliminary	Primary treatment
Reports/Records	SCADA	Screening
Sedimentation	Sludge drying beds	Sludge handling
Land applications	Sludge presses	Tertiary treatment

NON-technical training may include but not limited to:

Administration	Computers	Emergency planning
Management	First-aid	Safety
Confined spaces	Weather (wastewater related)	

All training must be approved by the Agency. Training providers or certified operators may request approval of training by the Agency.

Operators are required to maintain copies of the proof of training records for a time period of 6 years from the date of training. The Agency may audit proof of training by random selection or when additional information is necessary.

Proof of training records must include:

Course name	Training provider	Instructor/speaker
Location	Dates	Total hours completed
Attendance verifications records		

29. Does Illinois have reciprocity with wastewater certifying authorities from any other states?

Yes, depending on the reciprocal state. The certifying state's rules and regulations, in conjunction with an individual's education and employment qualifications, are used to determine the specific Illinois certificate that can be issued. Class R, Class K, operator-in-

training, and Collection System certifications are not eligible for reciprocity from another state.

30. Can the Agency ‘discipline’ wastewater operators?

Yes, the Agency can ‘discipline’ wastewater operators through the certificate sanction process. Potential causes for sanctions include, but are not limited to, the following:

- Obtaining or attempting to obtain certification by fraud or deceit.
- Gross negligence or gross misconduct in the operation of a wastewater treatment facility or pretreatment facility.
- Falsification of records and reports that are required by the Environmental Protection Act or any rules promulgated under it.
- Willful failure to maintain records and reports that are required by the Environmental Protection Act or any rules promulgated under it.
- Willful non-submission of records and reports that are required by the Environmental Protection Act or any rules promulgated under it.
- Willful violation of the Environmental Protection Act or any rules that are promulgated under it.
- A final judgment in a civil action or a conviction in a criminal action that an operator has performed any of the acts listed above.

Sanctions include, but are not limited to, prohibiting application for certification, probation, suspension, and revocation.

31. What does it mean if my wastewater certificate is suspended?

A suspended wastewater certificate is considered invalid during the suspension period. A certificate may be suspended for a period of up to 18 months. Experience obtained during the suspension period will not be considered for credit toward meeting certification eligibility requirements. At the end of the suspension period, the certificate is again considered valid. Experience obtained after the suspension is lifted will be considered for credit toward meeting certification eligibility requirements.

32. What does it mean if my wastewater certificate is revoked?

A revoked certificate is considered invalid. The operator may not reapply for any certificate for a period of not less than 18 months and not more than 4 years. Experience obtained during the revocation is not considered for credit toward meeting certification eligibility requirements. At the end of the revocation period, an operator must apply for and pass the certification examination for the desired level of certification to become certified as a wastewater operator again.

Municipal Operator Certification Program

All publicly owned wastewater treatment facilities and municipal wastewater treatment works not owned by an industry are classified in one of four groups. These groups are:

- Group 1 all wastewater treatment facilities 1.0 MGD or more design average flow (DAF) excluding lagoon systems and primary treatment systems
- Group 2 activated sludge systems with a DAF of less than 1.0 MGD
- Group 3 fixed film processes, stationary and rotating trickling filters, Rotating Biological Contactors, Imhoff tank systems, and sand filters with a DAF of less than 1.0 MGD and all primary treatment systems
- Group 4 all aerated and non-aerated lagoon treatment systems

The certified wastewater operator requirements for each group of wastewater treatment facilities are as follows:

- Group 1 wastewater treatment facilities require a certified Class 1 wastewater operator
- Group 2 wastewater treatment facilities require a certified Class 2 or Class 1 wastewater operator
- Group 3 wastewater treatment facilities require a certified Class 3, Class 2, or Class 1 wastewater operator
- Group 4 wastewater treatment facilities require a certified Class 4, Class 3, Class 2, or Class 1 wastewater operator

The eligibility requirements for the Class 1, Class 2, Class 3, and Class 4 wastewater certification examinations are given below. Operator-In-Training status will be granted for successful passing of certification exam (valid for 5 years)

Class 1 - Requires a total of 6 years experience

Minimum eligibility requirement - High school completion or GED certificate plus 3 years wastewater operator experience and the equivalent of 3 years substitutional experience

Class 2 – Requires a total of 4 years experience

Minimum eligibility requirement - High school completion or GED certificate plus 2 years wastewater operator experience and the equivalent of 2 years substitutional experience

Class 3 - Requires a total of 2 years experience

Minimum eligibility requirement - High school completion or GED certificate plus 1 year wastewater operator experience and the equivalent of 1 year substitutional experience

Class 4 - Requires a total of 1 year experience

Minimum eligibility requirement - 6 months wastewater operator experience and the equivalent of 6 months substitutional experience

Wastewater operator experience includes direct hands-on physical operation of wastewater treatment equipment and/or wastewater treatment processes, direct active field supervision of wastewater treatment equipment and/or wastewater treatment processes, and/or direct and active involvement in process control decisions for wastewater treatment processes. Wastewater operator experience must be acquired at a domestic/municipal wastewater treatment facilities.

Substitutional experience includes credit for completion of wastewater courses, credit for completed college work (applicable to Classes 3, 2 and 1 only), credit for completion of college programs one-year in length designed specifically for wastewater treatment works operation and that include hands-on operation, credit for experience operating collection systems or drinking water supplies. The only time college credit can be applied toward Class 4 eligibility is upon the successful completion of a one-year college program specifically designed for wastewater treatment works operation, which includes actual operation of a wastewater treatment works such as with the program offered through the Environmental Resource Training Center at Southern Illinois University at Edwardsville, and may be substituted for a maximum of one year wastewater operator experience. Partial credit for laboratory and/or maintenance experience at a wastewater treatment works may be granted if the minimum hands-on wastewater operating experience has been obtained.

Industrial (Class K) Operator Certification Program

There are two types of Class K (Industrial) certificates offered. The first type is facility-specific and covers a particular industrial wastewater treatment facility or pretreatment facility. Individuals who pass a facility-specific Class K examination are issued a certificate that is only valid for the specific industrial wastewater treatment or pretreatment facility for which the examination was taken. This is typically for a specific permit and/or location. Individuals seeking wastewater operator certification for multiple industrial wastewater treatment or pretreatment facilities requiring facility-specific Class K certification must complete and pass the facility-specific Class K examination for each treatment facility.

Persons seeking certification for a surface water or groundwater remediation treatment system for contamination resulting from gasoline, diesel fuel, kerosene, jet fuel, or heating oil may opt to take another type of Class K examination, the Class R (Water Remediation). A general Class R examination is available which covers treatment systems associated with these water remediation systems. Individuals who pass this general exam are issued a Class R general certificate that is valid for all water remediation systems for contamination resulting from gasoline, diesel fuel, kerosene, jet fuel, or heating oil.

Any individual who actively operates an industrial wastewater treatment or pretreatment facility or who actively supervises the operation of an industrial wastewater treatment or pretreatment facility is eligible for Class K wastewater operator certification. To be eligible for full certification, Class K wastewater operators must have a High School diploma or GED. A completed Class K certification application must be submitted for each industrial wastewater treatment or pretreatment facility for which Class K wastewater operator certification is sought.

The Class K certification expires after 5 years. The applicant must re-certify by requesting and successfully passing the Class K examination. There are no CEU requirements for the Class K certificate.

Collection System Operator Certification Program

This is a voluntary program available to individuals directly involved in the operation and maintenance of collection systems/sewers who choose to participate in a certification program. There is one level of collection system operator certification.

The minimum eligibility requirements for this certificate are:

- 1 year collection system operating experience
 - 6 months minimum hands on with the option to substitute wastewater courses and lab, operation and maintenance, or public water supply experience for a maximum of 6 months credit.
- High school education or equivalent
- All applicants must be able to read and write in English

The Collection System Operator Certificate has no expiration and is not subject to CEU requirements.

Certification Examinations

Municipal, Operator-In-Training, & Collection System Examinations

The questions used on wastewater and collection system examinations were developed by wastewater professionals, instructors, certified operators, etc. Each question has been validated by a panel comprised of experts who, collectively, have many years of experience in the wastewater and/or collection system operations field. Every question, with each of the four answer selections, has been examined for content, readability, accuracy, and relevance.

Each exam question is related to one of the following subject categories:

Activated Sludge	Mathematics
Chemical Addition	Motors
Collection Systems	Preliminary Treatment
Digesters	Primary Treatment
Disinfection	Pumps and Pumping
Electrical	Rotating Biological Contactors (RBCs)
Flow Measurement	Recordkeeping
General Information	Rules and Regulations
Imhoff Tanks	Safety and Health
Intermittent Sand Filters	Secondary Sedimentation
Laboratory	Sludge Drying Beds
Lagoons	Sludge Handling
Maintenance	Tertiary Treatment
Management	Trickling Filters

Each examination version has 100 multiple choice questions taken from the categories which are applicable for the certification level being tested on that particular examination. Although slight variations in subject categories and numbers of questions per subject category may exist between versions of examinations for the same certificate level, every effort is made to maintain consistency and equality between different examination versions for the same certificate level.

The table below indicates the subject categories generally associated with each of the four municipal/domestic certification examinations. These numbers are subject to change.

<u>Category</u>	<u>Class 4</u>	<u>Class 3</u>	<u>Class 2</u>	<u>Class 1</u>
Activated Sludge	4	10	15	18
Chemical Addition	0	1	3	2
Collection Systems	5	5	3	3
Digesters	3	5	8	8
Disinfection	7	3	5	5
Electrical	2	2	3	2
Flow Measurement	2	2	4	2
General Information	12	6	3	3
Imhoff Tanks	1	2	1	1
Intermittent Sand Filters	3	0	0	0
Laboratory	5	5	5	5
Lagoons	15	5	3	2
Maintenance	4	3	1	1
Management	2	2	3	5
Mathematics	10	10	10	10
Motors	2	2	2	2
Preliminary Treatment	2	2	2	2
Primary Treatment	2	4	2	2
Pumps and Pumping	2	4	4	4
RBCs (rotating biological contactors)	1	1	1	1
Recordkeeping	2	2	2	3
Rule and Regulations	1	2	2	2
Safety and Health	5	5	5	5
Secondary Clarifiers	1	1	2	2
Sludge Drying Beds	2	2	2	2
Sludge Handling	2	2	4	4
Tertiary Treatment	0	0	2	2
Trickling Filters	5	13	3	2

Each examination will increase successively in difficulty from the class 4 exam to the class 1 exam. The class 4 will emphasize lagoons and lagoon related math. The class 3 will emphasize fixed film and intermediate math. The class 2 will emphasize activated sludge and activated sludge math. The class 1 will emphasize activated sludge (advanced) and complex math.

The subject categories generally associated with the Collection System examination are:

Chemical Addition, Collection Systems, Flow Measurement, General Information, Maintenance, Management, Mathematics, Motors, Preliminary Treatment, Pumps and Pumping, Recordkeeping, Rules and Regulations, Safety

Individuals taking these examinations are given scratch paper, pencils, answer sheet, and one examination booklet containing questions, formulas and conversion factors. The only items that may be brought to the examination site are the examinee's Letter of Admission, a photo ID, and a calculator which must be non-programmable and incapable of storing alpha-numeric data. Other electronic devices (cell phones, smart watches, etc.) will not be allowed during the entire time an individual is in the examination room. A maximum of three hours is allowed to complete the examination.

Examination results are sent to an examinee's home address, typically within 30 days of the day the examination is taken. Each examinee receives a letter indicating whether he/she passed the examination accompanied by a detailed breakdown of performance on the examination. Examinees who fail to achieve a score of 70% on an examination can use these results to determine the areas to focus on for further study.

Examinees that score less than 70% wishing to re-test must submit a new exam request form, receive a Letter of Admission, and schedule a new exam date.

Industrial (Class K) Examinations

The examinations consist of multiple choice questions covering basic wastewater mathematics and short answer/essay questions designed to test an individual's knowledge of the wastewater facility for which certification is sought. Examinees should be familiar with the facility's state and/or NPDES permit(s) and should be capable of providing information pertaining to an industrial wastewater treatment works in the following areas:

- Flow schematics
- Purpose of each treatment unit
- Theory of operation (principles of treatment) for each treatment unit
- Measures used to prevent and correct process upsets
- Methods used for solids handling
- Sludge disposal technique
- Sources, characteristics, and concentrations of raw and treated waste
- Removal efficiencies for each treatment unit
- Effluent monitoring requirements
- Laboratory techniques and interpretation of laboratory results
- Safety considerations
- Rules and regulations which apply
- Record keeping
- Discharge limits and permit conditions

Individuals taking a Class K examination are given scratch paper, pencils, and one examination booklet containing questions, formulas and conversion factors. The only items that may be brought to the examination site are the examinee's Letter of Admission, a photo ID, and a calculator which must be non-programmable and incapable of storing alpha-numeric data. Other electronic devices (cell phones, smart watches, etc.) must be turned off the entire time an individual is in the examination room. A maximum of three hours is allowed to complete the examination.

Examination results are sent to an examinee's home address, typically within 8 weeks of the date the examination is taken. Examinees that score less than 70% wishing to re-test must submit a new exam request form, receive a Letter of Admission, and schedule a new exam date.

Wastewater Certification Examination Scheduling

1. Submit an Exam Request form. Be sure to write legibly. You should expect a Letter of Admission with a schedule in the mail in approximately 4 weeks. Once received, call or email the contact information listed on the schedule at the location of your choice.
2. Wait until examination results are received before scheduling to retake an examination. Be sure you have submitted an Exam Request form or have a new Letter of Admission when scheduling.
3. If you know ahead of time that you cannot make it to an examination for which you are scheduled, contact the Operator Certification Unit as soon as possible to cancel so another individual can possibly be scheduled in your place.

Contract Operation

Owners of wastewater treatment works, rather than employing a properly certified wastewater operator, may choose to meet the certified wastewater operator requirement by contracting either with an individual wastewater operator with the required wastewater certificate or with a contract operations firm. In either case, a copy of the signed contract is required to be submitted to the Agency for review. The section of the wastewater operator certification rules pertaining to contract operation is included below.

Section 380.1000 General

- a) The owner of a wastewater treatment works or pretreatment works who enters into a contractual agreement with a properly certified operator for the operation of a wastewater treatment works or pretreatment works shall submit a copy of the contractual agreement to the Agency.
- b) The contractual agreement must be submitted to the Agency within seven days of the effective date of the contractual agreement. The Agency must be notified by the owner in writing within seven days should the contract be terminated prior to the expiration date of the contract.

Section 380.1005 Contract Provisions

The contract must include the following:

- a) The parties involved, including names, addresses and phone numbers of each and the Operator's ID #;
- b) The specific starting and expiration dates of the contract;
~ note: contract terms should be no longer than 3 years
- c) The minimum number of visits to be made to the wastewater treatment works by the contract operator each week;
~ notes: see page 5 of the Wastewater Operator Contract Form for a guideline of the minimum number of required visits by facility type
- d) The duties and responsibilities of each party involved including, at a minimum, the party responsible for:
 - 1) Proper operation of the wastewater treatment works including meeting all NPDES permit effluent requirements;
 - 2) Sample collection pursuant to the NPDES Permit;
 - 3) Preparation and submittal of Discharge Monitoring Reports;
 - 4) Laboratory analysis;
 - 5) Maintaining lift stations;
 - 6) Maintaining spare parts inventory;
 - 7) Maintaining required operating records and reports;
 - 8) Providing labor and materials for correcting any maintenance and operational problems;
 - 9) Maintaining, and if necessary, implementing an emergency operating plan;

- 10) Performing preventive maintenance on equipment as recommended by the manufacturer; and
 - 11) Performing routine operational control testing as recommended by the Agency.
- e) The signature of each party of the contract (operator and owner/official custodian).

Section 380.1015 Documentation of Contract Provisions

The contract operator shall maintain records to document that all contract provisions are being met.

Section 380.1020 Contract Approval

The Agency will approve a contract agreement when the contractual operator is properly certified and the provisions of Sections 380.1000 and 380.1005 are satisfied. The Agency will withdraw an approval when it is determined that the contract provisions are not being met or are inadequate to assure proper operation of the wastewater treatment works.

Section 380.1025 Contract Modifications and Extensions

Modifications or extensions to contractual agreements must be submitted to the Agency as a new contract, including current dates and signatures.

SOURCES OF WASTEWATER STUDY/REFERENCE MATERIALS

SOURCE ADDRESSES

Southern Illinois University, Edwardsville
Environmental Resources Training Center
Campus Box 1075
Edwardsville, IL 62026-1075
(618) 650-2030
www.siu.edu/ertc/
email: siue-ertc@siue.edu

Department of Civil Engineering
California State University, Sacramento
6000 J Street
Sacramento, CA 95819 (916)
278-6142 www.owp.csus.edu
email: wateroffice@owp.csus.edu

CRC Press, Inc./Lewis Publishers 2000
Corporate Blvd., N.W.
Boca Raton, FL 33431
(800) 272-7737

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161

ORD Publications
P.O. Box 19962
Cincinnati, OH 45219
(513) 569-7562

Technomic Publishing Co., Inc.
851 New Holland Avenue, Box 3535
Lancaster, PA 17604
800/233-9936 or 717/291-5609

Texas Water Utilities Association
1106 Clayton Lane, Suite 101-E
Austin, TX 78723-1033

Water Environment Federation
Publications Order Department
601 Wythe Street
Alexandria, VA 22314-1994
(800) 666-0206
www.wef.org
email: pubs@wef.org

Water Professionals International
9400 Plum Drive, Suite 160
Urbandale, IA 50322 (515) 232-3623
www.gowpi.org/

Suggested Study/Reference Materials

CALIFORNIA STATE UNIVERSITY AT SACRAMENTO:

Operation of Wastewater Treatment Plants, a Field Study Training Program

- a. Volume I
- b. Volume II

Operation and Maintenance of Wastewater Collection Systems, a Field Study Training Program

- a. Volume I
- b. Volume II

Advanced Waste Treatment, a Field Study Training Program

Membrane Bioreactors (MBRs) – 2012 - ISBN 978-1-59371-064-4

ENVIRONMENTAL RESOURCES TRAINING CENTER (ERTC):

Math Review for Wastewater Certification

Stabilization Pond Filtration

Guide to Microscopic Evaluation for Sewage Treatment Operations

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY (IEPA):

35 Ill. Adm. Code, Subtitle C: Water Pollution

Design Criteria for Sludge Application on Land (35 Ill. Adm. Code 391)
(Request from Permits Section)

Procedures for the Certification of Operators of Wastewater Treatment Works
(35 Ill. Adm. Code 380)

ORD PUBLICATIONS &/or NATIONAL TECHNICAL INFORMATION SERVICE

(NTIS):

1. Stabilization Ponds Operations Manual, (USEPA 430/9-77-012)
2. Aerobic Biological Wastewater Treatment Facilities, (USEPA 430/9-77-006, N/055-001-01071-1)
3. Anaerobic Sludge Digestion, (USEPA 430/9-76-001)

WATER ENVIRONMENT FEDERATION (WEF):

(NOTE: WEF's Technical Publications Catalog includes many items in addition to those listed below.)

MOP 1 Safety and Health in Wastewater Systems

MOP 11 Operation of Wastewater Treatment Plants

Standard Methods for the Examination of Water and Wastewater - Latest Edition

Math Workbook for Collection System Operators

Wastewater Treatment Operator Grades I & II Exam Survival Guide

WEF/ABC Certification Study Guide for Wastewater Treatment Personnel

WEF/ABC Certification Study Guide for Collection Systems Personnel

WEF Wastewater Treatment Fundamentals III Advanced Treatment

MOP OM-10 Operation and Maintenance of Trickling Filters, RBC's, and Related Processes

MOP 16 Anaerobic Sludge Digestion

MOP OM-8 Operation and Maintenance of Sludge Dewatering Systems

Basic Maintenance of Circular Secondary Clarifiers - PROBE

Basic Maintenance of Rectangular Secondary Clarifiers - PROBE

MOP 5 Aeration in Wastewater Treatment

MOP OM-7 Operation of Extended Aeration Package Plants

Basic Activated Sludge Process Control - PROBE

Basic Maintenance of Diffused Aeration Systems - PROBE

Basic Maintenance of Mechanical Aeration Systems - PROBE

Wastewater Biology: The Microlife

Wastewater Biology: The Life Processes

Activated Sludge Microbiology

MOP OM-9 Activated Sludge

MOP 2 Preliminary Treatment for Wastewater Facilities

MOP FD-1 Sludge Thickening

MOP FD-9 Wastewater Residuals Stabilization

MOP FD-14 Sludge Conditioning

Wastewater Treatment Fundamentals I – Liquid Treatment

Wastewater Treatment Fundamentals II – Solids Handling and Support Systems

TECHNOMIC PUBLISHING CO., INC.

Applied Math for Wastewater Plant Operators

CRC PRESS, INC./LEWIS PUBLISHERS

Management & Supervision for Working Professionals

TEXAS WATER UTILITIES ASSOCIATION:

Manual of Wastewater Treatment

Resources Pertaining to Treatment Facility Security

1. Drinking Water and Wastewater Resilience (USEPA)
2. Management and Planning for Small Community Wastewater: Protecting Your Community's Assets: A Guide For Small Wastewater Systems (NETCSC)
3. Vulnerability Self-Assessment Tool (VSAT) and the Association of Metropolitan Sewerage Agencies (AMSA)
4. Emergency Preparedness USA (FEMA)
5. Guarding Against Terrorist & Security Threats: Suggested Measures for Drinking Water & Wastewater Utilities, Appendix B of Emergency Response Plan Guidance for Small & Medium Community Water Systems to Comply with the Public Health Security & Bioterrorism Preparedness & Response Act of 2002 (USEPA)
6. Guidance for Water Utility Response, Recovery, & Remediation Actions for Manmade &/or Technological Emergencies

Wastewater Operator Certification Contact Information

Illinois Environmental Protection Agency

Bureau of Water/ CAS #19

P.O. Box 19276

Springfield, IL 62794-9276

Telephone: (217) 785-1978

(217) 785-0561

(217) 782-7390

Email: EPA.OperatorCertification@illinois.gov

WASTEWATER MATH FORMULA SHEET

CONVERSION FACTORS

3 ft = 1 yd	27 cu ft = 1 cu yd	1,000 mg = 1 gm	1,440 min = 1 day
5,280 ft = 1 mi	7.5 gal = 1 cu ft	1,000 gm = 1 kg	10,000 mg/l = 1%
144 sq in = 1 sq ft	8.34 lbs = 1 gal water	1,000 ml = 1 liter	1.13 ft = 1 in Hg (Mercury)
1 ton = 2000 lbs	62.4 lbs = 1 cu ft water	1 gal = 3.786 liter	2.31 ft water = 1 psi
43,560 sq ft = 1 acre	746 watts = 1hp	1 lb = 454 gm	

1 Population Equivalent (PE) = 0.17 pounds BOD/capita/day
 = 0.20 pounds SS/capita/day
 = 100 gallons water/capita/day

ABBREVIATIONS

L = Length	W = Width	H = Height	r = Radius	d = Diameter
Q = Flow Rate	A = Area	V = Volume	v = velocity	c = circumference

CIRCUMFERENCE

Circle: $c = 2(\pi r)$
 $c = \pi d$

AREA

Rectangle: $A = L \times W$

Triangle: $A = \frac{1}{2} (B \times H)$

Circle: $A = \pi r^2$
 $A = .785d^2$

VOLUME

Cylinder: $V = \pi r^2 H$
 $V = .785d^2 H$

Basin: $L \times W \times H$
 Sphere: $\frac{4}{3}(\pi r^3)$

Cone: $V = \frac{1}{3} (\pi r^2 H)$
 $V = \frac{1}{3} (.785d^2 H)$

VELOCITY

Velocity: $\frac{\text{distance}}{\text{time}}$

FLOW

Flow (Q) = Area (A) x Velocity (v)

DETENTION TIME

Detention Time: $\frac{\text{Volume}}{Q \text{ (flow)}}$

POUNDS FORMULA

(concentration) x (flow or volume) x (constant)

SLOPE = $\frac{\text{rise}}{\text{run}}$

$\frac{\text{mg}}{\text{L}}$ (or ppm) x MG (or MGD) x 8.34 (pounds per gallon of water)

SEDIMENTATION AND LOADING RATE

Weir Overflow Rate: $\frac{\text{total flow}}{\text{length of weir}}$

Surface Settling Rate: $\frac{\text{flow rate}}{\text{surface area}}$

Solids Loading Rate: $\frac{\text{lbs solids applied}}{\text{surface area}}$

Percent Efficiency or Percent Removal: $\frac{(\text{in} - \text{out})}{(\text{in})} \times 100 \%$

Organic Loading Rate (Lagoon): $\frac{\text{lbs BOD per day}}{\text{acres of lagoon}}$

Organic Loading Rate (Trickling Filter): $\frac{\text{lbs BOD per day}}{1000 \text{ cu ft of filter}}$

ACTIVATED SLUDGE

SVI: $\frac{30 \text{ min settling volume (ml/L)}}{\text{MLSS (mg/L)}} \times 1,000 \text{ mg}$

Solids Inventory, lbs: (Tank volume, MG) x (solids concentration, mg/L) x (8.34 lbs / gal)

Gould's Sludge Age, days: $\frac{\text{Solids Under Aeration (MLSS), lbs}}{\text{Solids Added (influent TSS), lbs/day}}$

F/M: $\frac{\text{BOD Applied}}{\text{MLSS}}$

MCRT: $\frac{\text{Solids Inventory (lbs in aeration)} + (\text{lbs in clarifier})}{\text{Solids Wasted (lbs WAS)} + \text{Effluent Solids (lbs TSS)}}$

SLUDGE DIGESTION

Dry Solids, lbs: (sludge, gal) x (sludge, % solids) x (8.34 lbs / gal)

Lime Required, lbs: (sludge, MG) x (volatile acids, mg/L) x (8.34 lbs / gal)

Percent volatile solids reduction: $\frac{(\text{in} - \text{out})}{\text{in} - (\text{in} \times \text{out})} \times 100 \%$

HORSEPOWER, FORCE, ELECTRICAL

Water HP: $\frac{Q(\text{gpm}) \times 8.34 \text{ lbs / gal} \times \text{head (ft)}}{33,000 \text{ ft-lbs/min}}$

Brake HP: $\frac{\text{Water HP}}{\text{Pump Efficiency}}$

Suction Lift Pumping Condition: Total Dynamic Head = Discharge Head + Well Lift
 Suction Head Pumping Condition: Total Dynamic Head = Discharge Head – Suction Head

Power: Current x Voltage Voltage: Current x Resistance

Average Current:
$$\frac{\text{Line 1 Current} + \text{Line 2 Current} + \text{Line 3 Current}}{3}$$

Current Imbalance:
$$\frac{\text{Average Current} - \text{Maximum Deviation} \times 100}{\text{Average Current}}$$

Chemical Solution, lbs/gal:
$$\frac{(\text{solution } \%) \times (8.34 \text{ lbs/gal})}{100\%}$$

Mixed Concentration =
$$\frac{(\text{Upstream Flow})(\text{Upstream Concentration}) + (\text{Effluent Flow})(\text{Effluent Concentration})}{(\text{Downstream Flow})}$$

LAB PROCEDURES AND MEASUREMENTS

TSS, mg/L:
$$\frac{\text{Dry Sample (g)}}{\text{Amount of Sample (ml)}} \times 1,000,000 \text{ (conversion factor)}$$

VSS, mg/L:
$$\frac{\text{Dry Sample} - \text{Ash (g)}}{\text{Sample Volume (mL)}} \times 1,000,000 \text{ (conversion factor)}$$

VSS, %:
$$\frac{\text{Volatile Solids (mg/L)}}{\text{Total Suspended Solids (mg/L)}} \times 100 \%$$

% Moisture:
$$\frac{\text{Wet Sludge} - \text{Dry Solids}}{\text{Wet Sludge}} \times 100\%$$

BOD, mg/L
$$(\text{Initial DO} - \text{Final DO}) \times \frac{\text{Bottle Volume (mL)}}{\text{Sample Volume (mL)}}$$

Temperature Conversion: °F = (1.8 x °C) + 32
 °C = (°F – 32) / 1.8

Chlorine Demand (mg/L): dosage (mg/L) – residual (mg/L)

SLUDGE MATH

Gal/acre =
$$\frac{\frac{\text{lbs}}{\text{acre}}}{(\% \text{PAN})(\% \text{Solids})(8.34)}$$

SUBJECT BREAKDOWN

The following is a list of the main subject areas that may be covered on the examinations.

- I. General Information
 - A. Characteristics of wastewater
 - B. Activated sludge terminology

- II. Collection Systems
 - A. Routine operation and maintenance of collection system components
 - B. Sewer installation inspections
 - C. Troubleshooting collection systems

- III. Pumps and Pumping
 - A. Types of pumps and motors and their application
 - B. Operation and maintenance
 - 1. Pumps
 - 2. Motors
 - 3. Pump and motor controls
 - 4. Electrical

- IV. Flow Measurement
 - A. Instruments
 - B. Process controls

- V. Preliminary Treatment
 - A. Theory of preliminary treatment
 - B. Operation and maintenance
 - 1. Bar screens
 - 2. Barminutors
 - 3. Comminutors
 - 4. Grit chambers

- VI. Primary Treatment
 - A. Theory of primary treatment
 - B. Operation and maintenance
 - 1. Primary clarifiers
 - 2. Imhoff tanks

- VII. Secondary Treatment
 - A. Theory of secondary treatment
 - B. Operation and Maintenance
 - 1. Lagoons

2. Slow sand filters
3. RBC's
4. Trickling filters
5. Activated sludge units
6. Secondary Sedimentation

VIII. Sludge Handling

- A. Theory of sludge handling
- B. Operation and maintenance
 1. Anaerobic digesters
 2. Aerobic digesters
 3. Sludge drying equipment
 - a. Coil or cloth filters
 - b. Sludge drying beds
 - c. Filter presses
 4. Sludge lagoons
 5. Sludge thickening equipment
 - a. Flotation devices
 - b. Gravity thickening devices
 - c. Chemical addition and/or conditioning
 6. Sludge disposal
 - a. Land application
 - b. Landfill disposal
 - c. Incineration

IX. Tertiary Treatment

- A. Theory of tertiary treatment
- B. Operation and maintenance
 1. Polishing ponds
 2. Intermittent sand filters
 3. Rapid sand filters
 4. Microstrainers

X. Disinfection

- A. Theory of disinfection
- B. Operation and maintenance
 1. Chlorination systems
 2. Other disinfection systems

XI. Laboratory

A. Process control testing

1. BOD
2. TSS
3. COD
4. Settleable solids
5. Volatile solids
6. Volatile acids
7. Alkalinity
8. F/M ratio
9. Sludge age
10. SVI

B. NPDES testing

1. pH
2. BOD
3. TSS
4. Chlorine residual
5. Ammonia
6. DO
7. Heavy metals

XII. Safety and Health

- A. Clothing and apparel
- B. Machinery
- C. Chemical handling
- D. Laboratory
- E. Collection systems

XIII. Record Keeping

- A. Plant operations
- B. Laboratory data
- C. Financial data
- D. Maintenance data
- E. Accident data

XIV. Rules and Regulations

- A. 35 Ill. Adm. Code, Subtitle C: Water Pollution
- B. 35 Ill. Adm. Code Part 391 (Design Criteria for Sludge Application on Land)
- C. NPDES
- D. Local ordinances

- XV. Lagoons
 - A. Purpose of lagoons
 - B. Description of lagoons
 - 1. Aerobic lagoons
 - 2. Anaerobic lagoons
 - 3. Facultative lagoons
 - 4. Aerated lagoons
 - C. Operation of lagoons
 - D. Troubleshooting of lagoons

- XVI. Math
 - A. Problem solving
 - B. Formulas
 - C. Process control
 - 1. Volume
 - 2. Area
 - 3. Pounds formula
 - 4. Organic loading
 - 5. Hydraulic loading
 - 6. Detention time
 - 7. Velocity
 - 8. SVI
 - 9. MCRT
 - 10. F/M ratio
 - 11. Sludge age
 - 12. Clarifier math
 - 13. Sludge math
 - 14. Conversions
 - 15. Electrical, horsepower

PRACTICE QUESTIONS

The Hatfield Process is the same as the Kraus Process with the following exception.

- a) 10 to 15% of the return activated sludge stream is reaerated in the presence of anaerobic digester supernatant and digested sludge
- b) 65 to 70% of the return activated sludge stream is reaerated in the presence of anaerobic digester supernatant and digested sludge
- c) 100% of the return activated sludge stream is reaerated in the presence of anaerobic digester supernatant and digested sludge
- d) The Hatfield Process and the Krause Process are not similar enough to compare with only one exception

Below is a set of data or events, reflecting a problem at a pumping station. Wet well inlet Receives dry weather flow; lead pump cycles on at proper wet well level; lag pump cycle on a proper wet well level; wet well level drops after lag pump cycles on; discharge pressure rises after lag pump cycles on. Study the data carefully. Which of the following is the most probable cause of the problem?

- a) Lead pump's main fuse is blown
- b) Clogged suction line
- c) Lead and lag pumps do not alternate correctly
- d) None of the above

The discharge piping of a 3 phase induction motor driven centrifugal pump is rerouted such that the TDH against which the pump is pumping is reduced by 50%. This will cause:

- a) the motor to draw more amperage
- b) motor to run cooler
- c) motor to run faster
- d) the motor to draw less amperage

A magnetic flow meter is a:

- a) displacement meter
- b) differential head meter
- c) velocity head meter
- d) none of the above

Pre-chlorination is not used for:

- a) reduction of BOD
- b) aiding in sedimentation
- c) protection of plant structures
- d) disinfection

Which of the following is not a typical percentage for primary clarifier removal efficiency?

- a) Bacteria – 25% to 75%
- b) settleable solids – 90% to 95%
- c) Total solids – 60% to 75%
- d) BOD—25% to 35%

Given the following data, describe the action necessary to make the F/M ratio 0.3 assuming 75% volatile solids in the mixed liquor.

Data: Daily flow = 2.0 MGD, Average primary effluent = 120 mg/l, Aeration tank capacity = 500,000 gallons, SVI = 80, RAS concentration = 9,000 mg/l, MLSS = 3,000 mg/l.

- a) Increase sludge wasting
- b) Increase return sludge rate
- c) Decrease sludge wasting
- d) No action is necessary

The maximum temperature change an anaerobic digester should undergo per 24-hour period should be:

- a) 0.5 degree F
- b) 2 degrees F
- c) 5 degrees F
- d) none of the above

Anaerobic conditions in an intermittent sand filter:

- a) are normal
- b) Will have little effect on effluent quality
- c) Will have a significant effect on effluent quality
- d) Can be controlled by occasionally flooding filter

Which of the following is most potent disinfecting agent?

- a) Chlorine
- b) hypochlorous acid
- c) chloramines
- d) All of the above disinfect equally

If it takes 15 ml of 0.10 N H_2SO_4 to run a total alkalinity test using 100 ml sample, the total alkalinity, as $CaCO_3$ is:

- a) 7,500 mg/l
- b) 750 mg/l
- c) 75 mg/l
- d) 7.5 mg/l

Of the following items, what is the first thing the operator should do before he places his hand inside a pump volute to clear an obstruction?

- a) Make sure he has the proper tools to do the job
- b) Trip and lock out the circuit breaker
- c) Flush and drain the pump
- d) Put on rubber gloves

According to NPDES permit requirements, which of the following records are required to be kept?

- a) personnel records
- b) laboratory quality assurance records
- c) purchase orders
- d) annual operation and maintenance reports

A treatment facility is meeting effluent limits, however, it may be contributing to a violation of:

- a) nothing
- b) a BOD water quality standard
- c) a DO water quality standard
- d) a pH water quality standard

Given the following data, calculate the influent flow rate.

Data: MLSS = 2,800 mg/l, MLVSS = 2,000 mg/l, Return sludge concentration = 9,200 mg/l,
RAS flow rate 3.0 MGD.

- a) 5.8 MGD
- b) 6.9 MGD
- c) 7.6 MGD
- d) none of the above