NC Wastewater Operator Certification

Biological Wastewater Needs-to-Know Introduction for BOTH Grade 1 & 2

This document represents the minimum training standards required for an individual to qualify to take the NC Biological Wastewater Operator Grade 1 and 2 examinations.

The NTKs were approved by the Water Pollution Control System Operators Certification Commission (WPCSOCC) of the NC Operator Certification Program in the NC Department of Environmental Quality (NCDEQ).

All agencies and individuals conducting schools, courses, or classes for the purposes of meeting operator's training requirement for certification are required to follow this course standard and the Needs-To-Know (NTK) for each specific grade level to develop their curriculum and teaching outlines. We encourage each of the agencies and individuals teaching these courses to add to the standards, as you believe necessary to increase the learning of the operators.

Course Summary

Minimum Required Teaching Time:

Each Certification school provider will provide the minimum instruction of hours and can increase the training time as needed.

Course	Minimum Required Time
Grade 1	34 hours
Grade 2	38 hours
Grade 1 & 2 Combines Course	59 hours

Course Description:

This course is designed to provide the individual with general knowledge of the operation of wastewater treatment systems. The course will provide the individual with knowledge of the laws and regulations related to wastewater treatment systems operation, and equipment usually employed in such plants and the ability to describe the general maintenance requirements for

such plants. This course is designed to assist the individual in preparation for the North Carolina Water Pollution Control System Operators Certification Commission certification examination.

Reference Texts: (updated May 2026)

Many editions and other versions are available at online booksellers, NC One Water, . Originally this NTK used the Sacramento Manuals as a reference. The Water Environment Federation (WEF) also produces manuals that can be used as a reference. It is not required to purchase these reference texts. You may wish to talk to your instructor during class to determine if they will be useful study tools for you.

Grade 1:

- Available at Sacramento State Water program: https://www.owp.csus.edu/ Operation of Wastewater Treatment Plants, Volume 1, 8th edition
- Previous versions of this Sacramento Manual include: Small Wastewater System Operation & Maintenance - Vol. 1
- Similar manual available at Water Environment Federation (WEF): Wastewater Treatment Fundamentals 1. https://www.wef.org/publications/publications/books/wastewater-treatment-fundamentals

Grade 2:

- Available at Sacramento State Water program: https://www.owp.csus.edu/ Operation of Wastewater Treatment Plants, Volume 2, 8th edition
- Previous versions of this Sacramento Manual include: Small Wastewater System Operation & Maintenance - Vol. 2
- Similar manual available at Water Environment Federation (WEF): Wastewater Treatment Fundamentals 2. https://www.wef.org/publications/publications/books/wastewater-treatment-fundamentals

Grade 1 Minimum Required Hours per Certification School	
Needs-To-Know Topic	**Minimum Hours Required**
A. Introduction to Wastewater	2.5
B. Wastewater Collection Systems	0.5
C. Grease Traps / Grease Interceptors	0.5
D. Pumps	1.0
E. Septic Tank / Sand Filters Systems	3.0
F. Preliminary Treatment	1.0
G. Wastewater Lagoons and Ponds	3.0
H. Constructed Wetlands	1.0
I. Introduction to Activated Sludge	3.0
J. Disinfection	1.5
K. Sampling & L Lab procedures	3.0
L. Lab procedures	(included above)
M. Required Technical Knowledge (math)	6.0
N. Applied Electricity	1.0
O. Instrumentation & Controls	1.0
P. Health & Safety	3.0
Q. Laws & Regulations	3.0
Total Time:	**34.0**

Grade 2 Minimum Required Hours per Certification School	
Needs-To-Know Topic	**Minimum Hours Required**
A. Mechanical & Maintenance Operations	1.0
B. Preliminary Treatment	1.0
C. Sedimentation & Flotation	2.0
D. Attached Growth Systems	2.0
E. Activated Sludge	3.0
F. Sludge Digestion	3.0
G. Solids Handling & Disposal	2.0
H. Advanced Treatment	3.0
I. Disinfection	1.0
J. Instrumentation & Controls	2.0
K. Laboratory Procedures	3.0
L. Sampling	1. 0
M. Laws & Regulations	3.0
N. Public Relations	0.5
O. Required Technical Knowledge (Math)	5.0
P. Industrial Pretreatment	0.5
Q. Biology	2.0
R. Health & Safety	3.0
Total Time:	**38.0**

Grade 1 & 2 Combined Course

Grade 1+2 Combined Minimum Required Hours per Certification School	
Needs-To-Know Topic	**Minimum Hours Required**
Introduction to Wastewater	2.5
Wastewater Collection Systems	2.0
Grease Traps / Grease Interceptors	0.5
Pumps	1.0
Preliminary Treatment	2.5
Wastewater Lagoons & Ponds	3.0
Constructed Wetlands	1.0
Septic Tank / Sand Filters Systems	3.0
Disinfection	2.5
Instrumentation & Controls	3.0
Applied Electricity	1.0
Introduction to Activated Sludge	3.0
Mechanical & Maintenance Operations	1.0
Sedimentation & Flotation	2.0
Attached Growth Systems	2.0
Activated Sludge	3.0
Sludge Digestion	2.0
Solids Handling & Disposal	2.0
Advanced Treatment	3.0
Laboratory Procedures	3.0
Laws & Regulations	3.0

Public Relations	0.5
Required Technical Knowledge (Math)	6.0
Industrial Pretreatment	1.0
Biology	2.0
Health & Safety	3.0
Total Time:	**58.5**

NC Water Pollution Control System Operator Certification Commission

Biological Wastewater Treatment Systems

Grade 1

Needs to Know

- 2019 -

TABLE OF CONTENTS

GRADE 1: NEEDS-TO-KNOW

A. Introduction to Wastewater

1. What are the definitions and average ranges for the following parameters for "typical" domestic wastewater (see appendix):
   A. TSS (total suspended solids)
   B. BOD5 (biochemical oxygen demand)
   C. pH
   D. NH3 (ammonia)
2. What is the difference between inorganic and organic wastes?
3. What do the various odors of wastewater indicate?
4. What is the economic significance of improper treatment and disposal of wastewaters?
5. What are the effects of nitrogen and phosphorus on receiving waters?
6. What is treatment plant influent? Effluent?
7. What are the sources of wastewater?
8. What is a constructed wetland?
9. Differentiate between characteristics of fresh and stale wastewater.
10. Describe temperature variations of wastewater and their importance in treatment.
11. Describe how toxic materials could affect the biology of a wastewater treatment plant.
12. Describe typical daily and seasonal flow variations in wastewater.
13. Why is the oxygen content of streams important?
14. Define an oxygen sag point.
15. Explain the need for treatment of wastewater discharges.
16. Explain the importance of each of the following sources of organic and inorganic water pollutants:
    A. Point source discharges
    B. Non-point source discharges
17. Explain the role and importance of the hydrologic cycle in maintaining water resources.
18. Explain the difference between primary, secondary and tertiary treatment of wastewater.
19. Explain the purpose of each of the following treatment processes in a wastewater treatment plant and describe a reasonable arrangement for the processes.
    A. Primary settling
    B. Biological treatment
    C. Grit removal
    D. Flow measurement
    E. Screens
    F. Final settling
    G. Sludge solids
    H. Disinfection

B. Wastewater Collection Systems

1. Define and state the purpose of the following collection systems:
   A. Sanitary
   B. Stormwater
   C. Combined
2. Define and describe typical sources of infiltration, inflow and illegal connections.
3. Describe the importance of reducing inflow and infiltration (I&I) into a collection system.
4. Explain the significance of placing sanitary sewers at a slope sufficient to produce a water velocity of approximately two feet per second.
5. Explain the differences between gravity and force mains.
6. Explain the problems associated with an extended flow time in the collection system.

C. Grease Traps / Grease Interceptors

1. Describe a grease trap / grease interceptor and the circumstances under which one would be used.
2. Describe why hydraulic loading plays a role in the effective operation of an oil/water separator.
3. Describe why a grease trap / grease interceptor should be located as close to the source of wastewater as possible at a food service facility.
4. Describe the proper maintenance procedures for a typical grease trap / grease interceptor used by a food service facility.

D. Pumps

1. What is the purpose of a pump?
2. What is water hammer?
3. Identify situations that would cause a loss of prime and how to re-prime these pumps.
4. Describe various types of pumps:
   A. Centrifugal
   B. Positive displacement, plunger type
   C. Positive displacement, diaphragm type
   D. Positive displacement, progressive cavity (screw-flow type)
   E. Air lift pumps
   F. Peristaltic pumps
5. Describe the procedures for starting up and shutting down a centrifugal and positive displacement pump.
6. Describe cavitation and how it affects a centrifugal pump.
7. Describe basic pump maintenance.

E. Septic Tank/Sand Filter Systems

1. Describe how to inspect a septic tank for leakage and infiltration.
2. Describe the relationship between a septic tank and the dosing tank.
3. Describe the purpose of baffles within a septic tank.
4. Define detention time and how it affects septic tank performance.
5. Describe when, why and how to remove solids from a septic tank.
6. Describe the purpose of a dosing tank and the different types of dosing mechanisms.
7. Describe sand filters and how they function.
8. Describe recirculation and how it affects sand filter treatment efficiencies.
9. Describe the final disposal options associated with septic tank / sand filter systems.
10. Identify problems commonly associated with sand filters.
11. Identify the three functions of a septic tank (i.e. removal, storage and digestion).
12. Identify problems that may occur with septic systems and the visible signs that may indicate problems.
13. Identify the maintenance needs for sand filters.
14. Explain how media size, media depth and media surface affect treatment.
15. Explain how distribution of wastewater onto sand filter surfaces affects treatment.
16. Explain the importance of raking and leveling sand filters to avoid ponding.
17. Why is disinfection following filtration important?
18. List the safety hazards associated with septic tank / sand filter systems.
19. List the different forms of disinfection that may be used with septic tank / sand filters system.

F. Preliminary Treatment

1. Describe the objectives of screening in wastewater treatment plants.
2. Describe approved methods commonly employed for disposal of grit.
3. Explain corrective actions necessary in the event of failure of a mechanically-cleaned bar screen.
4. Identify different types of screens used in wastewater treatment plants and their advantages and disadvantages.
5. Identify the approved method(s) commonly employed for disposing of screenings in wastewater treatment plants.
6. Identify and state the purpose of comminutors.
7. What is grit in a wastewater? How does it affect a wastewater treatment plant?
8. What principle is used in designing grit removal chambers?

G. Wastewater Lagoons & Ponds

1. What is photosynthesis and why is it important in stabilization lagoons?
2. What are the advantages / disadvantages of waste treatment ponds?
3. What effect does detention time have on waste treatment ponds?
4. What is the normal color for a waste treatment pond and what do different colors indicate?
5. What are the advantages / disadvantages of operating waste treatment ponds in series and parallel modes?
6. What is “turnover” in waste treatment ponds and how does it affect treatment?
7. What is the purpose of recirculation in waste treatment ponds?
8. What is the purpose of “splash pads”?
9. What are the advantages of having a submerged inlet and outlet?
10. What is the role of algae in stabilization lagoons?
11. What is the difference between stabilization wastewater lagoons and polishing ponds?
12. What factors indicate that a stabilization lagoon is not operating properly?
13. What are safety hazards associated with wastewater treatment lagoons?
14. What are the advantages of baffles in a lagoon system?
15. Identify the different types of stabilization lagoons, explain the differences between them and describe proper operation and maintenance of each of the following types:
    A. Facultative lagoons;
    B. Aerobic lagoons;
    C. Anaerobic lagoons.
16. Describe operating ranges for pH, dissolved oxygen and alkalinity in both facultative and aerobic lagoons.
17. For the following problems associated with stabilization lagoons, list probable causes and corrective actions to be taken:
    A. Excessive algae blooms
    B. Weed growths
    C. Scum formation
    D. Odor production
    E. Erosion
    F. Loss of algae
    G. Septicity
    H. Low pH
    I. Blue-Green algae
18. In an aerobic lagoon, how are algae produced, how is oxygen produced by the algae, and what happens to the unstable organic matter?

H. Constructed Wetlands

1. Give two examples of plant life that may be used in wetlands discharge application.
2. What is the purpose of having a “sloped” bottom in wetlands disposal system?
3. What safety hazards are associated with wetland disposal systems?
4. Identify problems that can occur with a wetland system.
5. Describe how the two types of wetland systems operate.
6. Explain the most critical items in which an operator’s intervention is necessary during constructed wetland operations:
   A. Adjustment of water levels,
   B. Maintenance of flow uniformity,
   C. Management of vegetation,
   D. Odor control,
   E. Control of nuisance pests and insects,
   F. Maintenance of berms and dikes,
   G. Maturation of wetlands,
   H. Mechanical equipment maintenance, and
   I. Health and safety
7. Define water cycle.
8. Define plug flow.
9. Define vector.

I. Introduction to Activated Sludge

1. Define activated sludge
2. Define activated sludge process
3. Define oxidation.
4. Define microorganism.
5. Define food to microorganism ratio.
6. Define stabilized waste.
7. Define facultative, aerobic and anaerobic bacteria and their importance in the “Activated Sludge Process.”
8. Define eutrophication and its significance in lakes.
9. Define aerobic digestion.
10. Define biochemical oxygen demand (BOD) and the factors that affect its strength.

11. Define floc.
12. What are the end products of aerobic and anaerobic decomposition?
13. What are the purposes of clarifiers (primary and secondary)?
14. When solids are removed from the process where do they go?
15. What is the sludge age for extended aeration plant?
16. What is an air-lift used for in an extended aeration plant?
17. How is oxygen (air) supplied for aeration?
18. At what level should dissolved oxygen (D.O.) be maintained throughout the aeration tank?
19. Why is it necessary to waste sludge from the treatment process?
20. Why is oxygen added to the process?
21. When changes are made to the treatment process it may take how long for a response to be seen?
22. List four causes of odors at a treatment plant.
23. List causes of foaming at treatment plant.
24. Identify the following types of living organisms which are associated with wastewater,

    differentiate between them and know their significance:
25. Identify the importance of pH, alkalinity, dissolved oxygen (D.O.) and temperature in the biology of wastewater treatment.
26. What is the purpose of secondary activated sludge treatment?
27. What are a package plant and an oxidation ditch?

J. Disinfection

1. What is the purpose of disinfection of a treatment plant effluent? Explain the difference between disinfection and sterilization of wastewater.
2. What chlorine contact time usually provides reasonable disinfection of a wastewater treatment plant effluent?
3. What is the approved method of determining chlorine residual?
4. What would cause an increase in chlorine demand?
5. What are some alternate methods of disinfection?
   A. Chlorine
   B. Ultraviolet
6. What are fecal coliform bacteria?

7. What is dechlorination?
8. Define chlorine dosage, demand and residual.
9. Given data on chlorine demand and flow, be able to calculate daily requirements for chlorine additions.
10. Name three forms of chlorine that may be used to disinfect wastewater effluents.
11. State the physical and chemical properties of chlorine.
12. Why do you not store petroleum products and solid chlorine compounds in the same area?
13. Identify the safety equipment that must be available when handling chlorine.
14. Identify the following types of living organisms which are in wastewater, differentiate between them and know their significance:

    Bacteria

    A. Pathogens
    B. Indicator organisms (coliforms, fecal coliforms)

15. Identify and briefly describe the following factors which affect the disinfection efficiency when using chlorine:

    A. Combined, total or free chlorine residuals
    B. Contact time
    C. Temperature
    D. pH
    E. Presence and types of organic matter
    F. Number of pathogens
    G. Reducing agents
    H. Maintenance of contact basin
    I. Maintenance of chlorine diffusers

K. Sampling

1. What is the purpose of sampling?
2. What are the differences between a grab and composite sample?
3. What are the objectives of routine process control and compliance sampling?
4. What field parameters are typically measured in the effluent and receiving waters?
5. Describe circumstances when grab and composite samples may be desirable.
6. Describe techniques and precautions necessary to collect representative samples of wastewater.

7. Explain the importance of the following in sampling:

A. Cleanliness of containers and measuring devices;
B. Accuracy of records (labels, locations, time, data, type sample, weather, other information);
C. Refrigeration of samples;
D. Chemical preservation of samples;
E. Chain-of-custody.

8. Why is it necessary to note the physical characteristics of the sample and sample site?
9. Why should the receiving waters be sampled above and below the discharge point?
10. Identify locations in a treatment system where it would be appropriate to make various solids determinations.
11. Describe how to solve problems to determine the volume that should be collected at each time interval to form a composite sample that is flow proportional.
12. Define the following types of samples:
    A. Grab;
    B. Flow proportional composite samples;
    C. Continuous composite samples;
    D. Timed composite samples.

L. Laboratory Procedures

1. What is the reason for performing wastewater analyses and discuss the requirements for using approved methods?
2. What measurements must be performed on a sample immediately after it has been collected?
3. What information should be included on chemical reagent bottle labels?
4. What is an Imhoff cone and how is it used? Given a drawing or diagram, be able to accurately read an Imhoff cone.
5. What is meant by the pH of wastewater and what is its significance?
6. Define each of the following analyses and explain its significance:
    A. Temperature;
    B. Dissolved oxygen (meter);
    C. Chlorine residual;
    D. Settleable solids.
    E. Biochemical Oxygen Demand (BOD)
7. Describe the proper procedures for calibrating pH and dissolved oxygen meters.
8. Why should NO SMOKING areas, exits and evacuation routes be clearly identified?
9. Explain why distilled water, and/or deionized water, is necessary.

10. Explain the significance of the following common elements and compounds in wastewater treatment operations. Know the chemical symbols for each one.

A. Oxygen (O)
B. Carbon (C)
C. Phosphorus (P)
D. Nitrogen (N)
E. Carbon dioxide (CO_2)
F. Methane (CH_4)
G. Hydrogen Sulfide (H_2S)
H. Hydrogen (H)
I. Sulfur (S)
J. Chlorine (Cl)
K. Metals:
    1) Chromium (Cr)
    2) Lead (Pb)
    3) Copper (Cu)
    4) Zinc (Zn)
    5) Cadmium (Cd)
    6) Aluminum (Al)
    7) Iron (Fe)
    8) Nickel (Ni)

M. Required Technical Knowledge (math)

1. Explain how to solve problems pertinent to treatment plant operations involving the following:
    A. Fractions
    B. Decimals
    C. Addition and subtraction
    D. Multiplication and division
    E. Percentage
    F. Measurement
    G. Metric system
    H. Units of expression

*** These items will not be taught at any of the schools.**
Operators are expected to have learned this information during their High School studies.

2. Explain how to solve word problems, interpret formulas, and solve simple equations involving:
    A. Addition
    B. Subtraction
    C. Multiplication
    D. Division

3. Given appropriate data, be able to calculate the following:
    A. Pounds formula - all variations
    B. Circumference of a circle

C. Area of a circle
D. Area of a rectangle
E. Volume of a cylinder
F. Volume of a tank (rectangular)
G. Conversions to and from:

1) Cubic feet to gallons
2) Gallons to pounds
3) MGD to GPD to GPM to CFS
4) Micrograms, milligrams, grams and kilograms
5) Milliliters, liters
6) Seconds, minutes, hours, days, years
7) Square feet, acres
8) Inches, feet, yards, millimeters, centimeters, meters, kilometers
9) Detention time
10) Efficiency or removal efficiency
11) Geometric means for fecal coliforms
12) Pond equations:

a. Pond population equivalent
b. Pond area: acres
c. Pond volume: acre-feet
d. Pond detention time: days
e. Pond hydraulic loading: inches/day
f. Pond organic loading: lbs BOD/day/acre
g. Pond population loading: persons/acre
h. Concentration to percent

4. Describe how to "read" or translate numbers into words and words into numbers.
5. Explain how to solve simple algebraic equations.
6. Calculate the geometric mean for the fecal coliform test when given appropriate data.

N. Applied Electricity

1. Define and explain the following terms:
   A. Short circuit
   B. Grounded circuit
   C. Open circuit
2. Identify the type of instrument used to check the following:
   A. Voltage
   B. Amperage
   C. A complete circuit
3. What is the purpose and function of fuses and circuit breakers?
4. Explain why many electric switches in wastewater treatment plants should be explosion proof and moisture proof.

5. Explain the reasons for the following basic precautions when working on or near electrical equipment:
    A. Only qualified personnel should be allowed to work on electrical equipment.
    B. Use of lockout switches and tags.
    C. All electrical equipment and lines should be considered energized until proven otherwise.
    D. Metal tools should be prohibited around electrical equipment.
    E. Two men working as a team (buddy system) should be used while working on electrical equipment.
    F. Rubber gloves should be worn when working on electrical equipment.
    G. Avoid grounding of workers to metal or water.
    H. Never bypass safety devices.
    I. Use tools with insulated handles.
    J. Use grounded electrical tools.
    K. Keep electrical equipment clean.
6. Describe the importance of grounding as a protective device.
7. Describe the purpose and operation of audio and visual warning devices.
8. Describe the proper operation and maintenance of motors and electrical equipment in a wastewater treatment plant.
9. Why should electric motors be kept clean?
10. Why should oil and grease be kept away from the windings of electrical motors?

O. Instrumentation & Controls

1. Given drawings or diagrams, be able to identify the following flow measuring devices and their functions:
    A. Parshall flume
    B. Rotameter
    C. Weir
    D. Bubbler system
    E. Mechanical floats
    F. Staff gauges
    G. Magnetic flow meter
    H. Ultrasonic

2. Explain how the following pump controls work:
    A. Bubble tubes
    B. Float switches
    C. Pump alternator

P. Health & Safety

1. Explain the need for safety in wastewater treatment plants.
2. Explain reasons for the following basic rules of good personal hygiene in wastewater treatment plants as listed below:
    A. Keep hands and fingers away from eyes, ears, nose and mouth.
    B. Wear rubber gloves.
    C. Wash hands before eating and smoking.
    D. Do not store personal clothes with work clothes.
    E. Give cuts and scratches first aid immediately.
    F. Take a shower after work.
    G. Receive inoculations for typhoid fever, tetanus, etc.
    H. Provide waterless hand cleaners at various locations throughout the plant.
    I. Explain why each of the following precautions is important:
    J. Do not lift more than can be handled comfortably.
    K. Establish a solid footing and good balance before lifting.
    L. Get as close to the load as possible when lifting or carrying.
    M. Keep the back straight, gripping the object firmly, and using the legs to provide lift.
    N. Never carry a load that is too large to see over or around.
3. Describe hazards commonly encountered with respect to falling and explain methods for minimizing them.
4. Describe the hazards of infection and explain how to minimize them.
5. Describe special hazards existing in treatment plants with respect to drowning and explain how to minimize them.
6. Describe the basic good housekeeping measures listed below, explain the reason for each and describe why they encourage safety:
    A. Have a routine cleaning program.
    B. Keep floors dry or provide platforms.
    C. Remove trash and loose debris.
    D. Repair loose boards, holes, splinters and protruding nails.
    E. Keep walkways free of oil, grease and sludge.
    F. Keep combustible wastes in metal airtight containers and remove from the plant daily.
    G. Regular painting.
    H. Grass mowed and trimmed.
    I. Prompt cleanup of spills.
    J. Clean windows.
    K. Use of kick plates on catwalks and raised surfaces.
7. Describe the physiological effects of harmful gases to the respiratory system, nerves, blood, etc.
8. Describe how to test for harmful gases before entering manholes or other closed structures.
9. Describe why the following procedures are necessary when harmful gases exist in work areas:
    A. Purging to remove toxic or flammable gases.
    B. Use of self-contained air packs in the event of a chlorine leak.
10. Describe the actions that should be taken and reports that should be prepared following an accident.

11. Why should non-potable water sources be clearly marked?
12. Why is it especially important for wastewater treatment plant operators to have knowledge of first aid?
13. Identify electrocution hazards in wastewater treatment plants and explain how to minimize them.
14. Identify and describe hazards and appropriate safety precautions in wastewater treatment plant and collection systems with respect to:
    A. Gases
    B. Poisonous substances
    C. Suffocation
    D. Explosions
    E. Confined spaces
    F. Blood-borne pathogens
    G. Common wildlife hazards
15. Identify types of equipment that should be used for protection against poisonous gases.
16. Identify the explosive concentration range of the various gases encountered in wastewater treatment.
17. Identify types of protective clothing that should be available in wastewater treatment plants and describe conditions under which each type of protective clothing should be worn.
18. Identify the poisonous snakes and insects (water moccasins, black widow and brown recluse spiders, fire ants, wasps, etc.) that may be encountered in and around a wastewater treatment plant and describe the first aid actions that will be needed in the event of a bite or sting.
19. Identify where you can obtain training films and other training aids in order to carry out safety training programs.
20. Why is noise considered a safety hazard?
21. What action must be taken when electrical equipment is repaired or installed in a wastewater treatment plant and in collection systems?
22. What are the three ingredients necessary for a fire?
23. What is the Occupational Health and Safety Act (OHSA), what is involved in complying and who is the administrator?
24. What percent oxygen concentration is necessary in air to sustain life?
25. What is MSDS and what is its function?
26. What are the employer's responsibilities for providing necessary safety equipment?
27. What types of security measures should be enforced regarding the following and why?
    A. Fencing
    B. Limited access
    C. Supervision of visitors
28. What emergency phone numbers should always be kept posted in a conspicuous place?
29. Explain the need for fire proofing chemical storage facilities.
30. Explain the importance of proper lighting as a safety measure.
31. Describe routine testing and maintenance procedures, which should be followed to ensure proper operation of safety equipment and measures.
32. State the purpose of each of the following items of safety equipment and explain how it works:

A. Portable fresh air blower.
B. Atmospheric testing equipment.
C. Self-contained breathing apparatus.
D. Respirator/Inhalator.
E. First aid kit.
F. Barricades, traffic cones and warning signs.
G. Firefighting equipment.
H. Explosion-proof portable lights.
I. Safety harness and lifelines.
J. Ring buoys with line
K. Chlorine repair kit.
L. Protective clothing.

33. Describe the importance and typical locations for installation of guardrails, warning signs and other protective equipment in wastewater treatment plants.

34. Describe the reason for each of the following precautions when working in below-ground structures:

A. Placing warning devices, barricades or guard rails around manholes.
B. Placing trucks and equipment between working area and traffic.
C. Removing manhole covers with hoists or hooks.
D. Prohibiting smoking in any underground structure.
E. Testing for oxygen deficiency and dangerous gases.
F. Requiring each worker entering a manhole to wear a harness and lifeline.
G. Stationing two men at the entrance to a manhole while a third worker is in the manhole.
H. Ventilating and purging the underground structure with fresh air.
I. Using non-sparking tools, shoes with rubber soles, and safety lights.
J. Permitting no open flames in or near the structure.

35. Describe the safety requirements needed with respect to belts, coupling guards, electrical disconnects and lockout procedures.

36. Describe the requirements of the "Right to Know" regulations.

37. Describe how to organize and implement a good safety-training program. What are some of the main issues that should be addressed?

Q. Laws & Regulations

References:

- ***North Carolina Administrative Code: Chapter 8***
- ***Water Pollution Control System Operators Certification Commission***

Certification Rules:

1. Identify the North Carolina governmental agency that has principal responsibility for water pollution control activities statewide.

The Division of Water Resources (DWR) in the Department of Environmental Quality (DEQ)

2. Identify the federal agency which has primary responsibility for establishing policy and regulations concerning water pollution control nation-wide.

   The United States Environmental Protection Agency (US EPA)

3. Describe the functions of the Water Pollution Control System Operators Certification Commission.

   The Commission has two functions:

   A. Classification of water pollution control systems;

   B. Certification of water pollution control system operators.

4. Explain the regulatory requirement for a certified operator in responsible charge (ORC) for each water pollution control system in North Carolina.

   When notified by the Commission of the classification of a water pollution control system, the owner of that system must designate an operator in responsible charge (ORC) who holds a certificate of equal type and grade as the classification of the system.

5. Identify the agency to which NPDES reports must be sent and explain the frequency with which those reports must be submitted to the agency.

   Monthly reports are to be sent to the Division of Water Resources (DWR) in Raleigh.

6. Describe the justification for having the regulations regarding stand-by power.

   Adequate stand-by power must be available to prevent overflows from wastewater collection systems and to prevent untreated wastewater from being released from water pollution control systems.

7. Describe the current State regulatory procedure with respect to water pollution violations and identify penalties that can be imposed for those violations.

   A civil penalty of not more than $25,000 per day per violation may be assessed for any NPDES permit limit violation, or water quality standard violation, against the permit holder, or the operator, of a water pollution control system. In addition, a civil penalty, not to exceed $25,000 per day per violation, may be levied for continuous water quality violations against the permit holder, or the operator, of a water pollution control system.

8. Describe the five basic NPDES monitoring parameters and state the significance of each in the regulatory control of wastewater:

   A) Flow - The basic unit of daily volume discharge;

   B) BOD - The best indicator of wastewater strength;

   C) Suspended solids - Readily determined measure of treatment efficiency;

   D) pH - Critical factor in protecting aquatic life;

   E) Fecal coliform - Indicator organism for determining pollution problems.

9. Under what circumstances may a certified operator's certification be revoked?

   The Water Pollution Control Systems Operator Certification Commission may revoke the certificate of any certified operator when it is found that:

   A. The operator has practiced fraud or deception in the performance of his or her duties as a certified operator.

   B. Reasonable care, judgment, or the application of the operator’s knowledge or ability were not used during the performance of his or her duties as a certified operator.

C. The operator is incompetent or unable to properly perform his or her duties as a certified operator.

D. Intentionally supplying false information in order to obtain, or maintain, certification

E. Cheating on a certification examination.

10. Distinguish between voluntary compliance and compulsory compliance.

    Compulsory compliance is mandated by conditions of the user's permit. Voluntary compliance is an agreement between users and regulatory agencies usually of a temporary nature.

11. What is the Clean Water Act?

    PL 92-500 is the Federal Water Pollution Control Act (1970). It is now the Clean Water Act. The ultimate goal is to maintain water qualities such that all waters are fishable and swimmable.

12. Be familiar with the laboratory certification requirements.

13. Explain the value of records as a tool in operating and planning wastewater treatment facilities.

14. State the purpose of NPDES Permit monthly monitoring reports.

15. Explain NPDES reporting procedures, including frequency of data collection, report preparation, report submission, responsibility for accuracy, and timeliness.

16. Identify the agency to which the NPDES reports should be submitted.

17. What monitoring reports are required by the State?

18. State the type of records and reports, which must be kept at the wastewater treatment plant and how long they must be kept there.

19. Given appropriate forms and data, prepare a monthly report to the State.

20. Identify reasons for maintaining the following records at a treatment plant and state what information must be included in each type of record:

    A. The plant log book;

    B. Wastewater flows (maximum, minimum, average)

    C. Wastewater temperature

    D. Weather conditions

    E. Plant units in operation

    F. Plant units out of service and reasons why

    G. Laboratory analytical results (see sampling laboratory procedures)

    H. Work in progress

    I. Work completed

    J. Important communications received and sent

    K. Breakdowns

    L. Personnel absences

    M. Accidents

    N. Visitors

    O. Miscellaneous

    P. Sludge disposal records

21. What is the laboratory field parameter certification? Who has to be certified and for what

parameters?

Field Parameters Lab Rules

1. What are the purposes of the Laboratory Certification rules?

   A. To assure that consistent and method compliant data is being reported to North Carolina regulatory agencies.
   B. To set certification criteria for laboratories performing any tests, analyses, measurements or monitoring required under G.S. 143 Article 21.
   C. Establish fees for certification program support.

2. What are the ways to assure that technicians performing field parameter testing are performing the analysis properly?

   By a thorough review of bench sheets used by the facility by both internal and external data reviewers. When all information regarding the test parameters have been properly listed it, provides assurance that all of the method requirements have been achieved and performed properly. A copy of each approved analytical method is required to be kept on site.

3. What six analytical parameters (field tests) are covered by field parameter certification?

   A. Specific Conductance (Conductivity)
   B. Dissolved Oxygen
   C. pH
   D. Settleable Residue
   E. Total Residual Chlorine
   F. Temperature

4. What is the NCLC program, and what does it do?

   The North Carolina Laboratory Certification program is the group responsible for compliance and enforcement of laboratory certification regulations.

5. What is involved in proficiency testing, and how often must this type of performance evaluation be performed once the laboratory is certified?

   Proficiency testing consist of obtaining a blind sample of “unknown” value for each of the parameters for which you are certified, these “unknown” samples are obtained from an accredited provider that supplies the actual value of the “unknown” sample to the NCLC program and the client. North Carolina uses the NIST (National Institute of Standards and Technology) vendors. The certified laboratory then performs analysis of the sample and reports the value to the NCLC program where it will be reviewed for accuracy. Each facility must analyze one passing performance evaluation sample per year for each method for which certification is obtained.

6. Which two of the six analytical parameters that are covered by field parameter certification do not have performance evaluation (PE) samples of “unknown” value that can be used for annual proficiency testing?

   Dissolved Oxygen and Temperature blind samples are not available; performance evaluation results are currently not required for these.

7. How long must the data for each analysis from a field parameter sample be kept and what information is required for each sample analyzed?

   Pertinent data for each analysis must be maintained for 5 years. Required information is…

   - Date and time sample collected

- Date and time of analysis
- Sample site
- Collector's and analyst's name
- Meter calibration record(s)
- True value and % recovery of all standards or buffers analyzed
- All data must be labeled with the proper units of measure

8. What is a bench sheet and what needs to be included on it?

   A bench sheet is a printed sheet with spaces provided for information relative to the analysis being performed, it must contain:

   - Date and time sample collected
   - Date and time of analysis
   - Sample site
   - Collector's and analyst's name
   - Meter calibration record(s)
   - True value and % recovery of all standards or buffers analyzed
   - All data must be labeled with the proper units of measure

9. For each instrument used for field parameter readings, how are calibrations documented?

   A record of instrument calibration where applicable, must be filed in an orderly manner so as to be readily available for inspection upon request. It is recommended that calibration information is included on the same bench sheet as the daily data. Each facility must maintain a record of instrument calibration each analysis day. In cases such as residual chlorine and pH, where a calibration check standard is analyzed, the facility must document both the reading of the check standard as well as the applicable acceptance range.

10. What are some of the actions that can result in a laboratory being decertified?

    A. Failing to maintain the facilities, records, personnel, equipment or a quality control program.

    B. Submitting inaccurate data or information

    C. Failing to pay required fees by due date.

    D. Failing to discontinue supplying data for clients or programs when a decertification is in effect.

    E. Failing to provide a split sample to the state when requested.

    F. Failing to use approved methods.

    G. Failing to report changes in laboratory supervisor or equipment changes within 30 days.

    H. Failing to report analysis of required annual performance evaluation by due date.

    I. Failing to allow an inspection by an authorized representative.

    J. Failing to supply analytical data requested by state laboratory.