

OPERATOR NEED-TO-KNOW

WATER TREATMENT

CLASS 1

SKILL LEVEL REQUIREMENTS

- A. Know the reason for adding fluoride to water, the amount desired, and the method of testing necessary.
- B. Know the fluoridation chemicals most commonly used, their characteristics, and handling procedures.
- C. Know the reason for adjusting pH, and what pH is a measure of.
- D. Know what chemicals are used to adjust pH, their characteristics, and handling procedures.
- E. Know what is meant by a comparator, how it is used, and how to minimize reading errors.
- F. Know the various types of feeders used in this type and class facility and how the chemicals are fed.
- G. Know how to run a calibration check on a solution feeder.
- H. Know the maintenance procedure for feeders.
- I. Know the reason for chlorinating, the materials used, the methods of application, and the test procedures.
- J. Know the quantitative per capita water requirements.
- K. Know the safe handling of chlorine and other chemicals used in water treatment in this type and class facility.
- L. Know and understand use of chlorine and other chemicals for sterilization.
- M. Know and understand water quality standards as formulated by E.P.A., Health Department, or other governmental agencies.
- N. Have basic knowledge of the principals of aeration, coagulation/flocculation, sedimentation, iron and manganese removal, softening, filtration, corrosion control, taste and odor control, maintenance, pumps, electric motors, electricity and cross connection control.
- O. Know the reasons for measuring turbidity and the basic test procedures.
- P. Have basic understanding of applicable state/federal regulations.

MATH NEED TO KNOW

Converting of Standards

Area Calculations

OPERATOR NEED-TO-KNOW

WATER TREATMENT

CLASS 2

SKILL LEVEL REQUIREMENTS

- A. Know all the skills required in the lower class.
- B. Know what impurities are found in water and what undesirable effects they cause.
- C. Know what materials may be removed by degasification (aeration) equipment as well as the problems created by such equipment.
- D. Know what impurities can be neutralized and/or oxidized by chemical feed and what chemicals are so used.
- E. Know what ion exchange is and what is used to remove, what media are capable of.
- F. Know the operation and maintenance procedures for ion exchange units (both softening and Fe-Mn removal).
- G. Understand the basic principles of and the operation of iron removal plants using oxidation followed by settling and/or filtration.
- H. Know what tests are run on plants in this type and class and be able to run them.
- I. Know how to collect chemical and bacteriological samples from a plant.
- J. Know how chlorine demand is determined and the various forms of residual chlorine.
- K. Know and understand the principles of aeration, coagulation/flocculation, sedimentation, iron and manganese removal, lime softening, ion exchange softening, filtration, disinfection, corrosion control, taste and odor control, maintenance, pumps, electric motors, electricity, and cross connection control.
- L. Know and understand basic capacity calculations and velocity calculations as applied to water treatment.
- M. Know and understand applicable state/federal regulations.
- N. Know water plant arithmetic according to the table.

MATH NEED TO KNOW

Converting of Standards

Area Calculations

Volume Calculations – Circle & Square

Converting of Flow Rates

Velocity

OPERATOR NEED-TO-KNOW

WATER TREATMENT

CLASS 3

SKILL LEVEL REQUIREMENTS

- A. Know all skills required in lower classes.
- B. Know the physical and bacteriological characteristics of surface water and well waters.
- C. Know what chemicals are used in water treatment, what they do, and how they are handled.
- D. Know how chemicals are fed and the operation and maintenance of feeders, including calibration.
- E. Know how to run jar test.
- F. Know how to run all chemical test for chemical coagulation and softening plants. (chlorine, turbidity, pH, temperature, hardness, phenolphthalein and total alkalinity).
- G. Know the purpose of, operations, control, and maintenance of mixing equipment (Chlorine, pH, turbidity).
- H. Know the operation, control and maintenance of flocculation equipment.
- I. Know the purpose, operation, control, and maintenance of settling tanks, including comparison of upflow and straight line units.
- J. Know the purpose, operation, control, and maintenance of filters, including appurtenances such as loss of head gages and rate of flow controllers.
- K. Know the operation and control of chlorination systems including gas and hypochlorination equipment.
- L. Know the safety aspects of water treatment and know the safety features of a properly designed chlorine equipment/storage building.
- M. Know the various types of valves, pumps, and similar equipment and the operation and maintenance of each.
- N. Know how to compute chemical requirements and costs of water treatment.
- O. Know how to compute pump rates, filter rates, horsepower requirements.
- P. Know how bacteriological tests are run and be able to interpret results.
- Q. Know how to compute retention times.
- R. Know how to find the break-point for chlorination and understand the process of breakpoint chlorination.
- S. Know how to calculate chemical dosage.
- T. Know how to read and interpret a pump performance curve.
- U. Know, understand, and have a good working knowledge of applicable state/federal regulations.
- V. Understand what causes trihalomethanes, their health effects, and methods of THM control.

- W. Understand VOC removal (air stripping and GAC filtration).
- X. Know water plant arithmetic according to the table.

MATH NEED TO KNOW

Converting of Standards

Area Calculations

Volume Calculations – Circle & Square

Converting of Flow Rates

Velocity

Chemical Dosage (Simple)

Chemical Requirements

Pump Rates

Filter Rates

Horse Power

Retention Time

Treatment Cost

OPERATOR NEED-TO-KNOW

WATER TREATMENT

CLASS 4

SKILL LEVEL REQUIREMENTS

- A. Know all skills required in lower classes.
- B. Know how to select treatment methods for various raw water characteristics.
- C. Know how to estimate chemical dosage from raw water analysis and finished water requirements and compute chemical requirements to treat a given amount of water.
- D. Know how to prepare and interpret pump performance curves from given test data.
- E. Know the various methods of sludge disposal and regulations.
- F. Know how to determine treatment costs and make cost reports.
- G. Know how to determine manpower requirements to provide continuous plant operation.
- H. Know how to set up a bacteriological lab testing program, including knowing the laboratory procedures.
- I. Know how to plan and carry out a public relations program.
- J. Know how to measure evaporation and calculate water loss from an impoundment by evaporation.
- K. Know how to plan and carry out a public relations program.
- L. Know what instrumentation and control equipment is common to water treatment plants of this class including SCADA.
- M. Know, understand, and have an expert working knowledge of applicable state/federal regulations.
- N. Know how to analyze for and interpret results of the following laboratory tests (by priority): chlorine, turbidity, pH, temperature hardness, phenolphthalein and total alkalinity, color, total dissolved solids, chlorides and fluoride.
- O. Understand reverse osmosis.
- P. Understand electro dialysis.
- Q. Know water plant arithmetic.

MATH NEED TO KNOW

Converting of Standards
Area Calculations
Volume Calculations – Circle & Square
Converting of Flow Rates
Velocity
Chemical Dosage (Simple)

Chemical Requirements
Pump Rates
Filter Rates
Horse Power
Retention Time
Treatment Cost