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 electrodialysis.
Q. Know water plant arithmetic.

MATH NEED TO KNOW
Converting of Standards Chemical Requirements
Area Calculations Pump Rates
Volume Calculations – Circle & Square Filter Rates
Converting of Flow Rates Horse Power
Velocity Retention Time
Chemical Dosage (Simple) Treatment Cost