

Kansas Class III & IV Water Operator Need to Know

April 22, 2009



Kansas Department of Health and Environment
Division of Environment
Bureau of Water
1000 SW Jackson Street, Suite 420
Topeka, KS 66612-1367

Healthy Kansans living in safe and sustainable environments

The Kansas Department of Health and Environment (KDHE) has compiled the following minimum knowledge expectations for water operators. The intent of this document is to identify those items which individuals are expected to comprehend in order to serve as water operators. This document is not intended to serve solely as a study guide for operator certification examinations. In order to pass a certification examination, an operator must possess knowledge gained through formal education and training as well as on-the-job experience.

Kansas Class III and IV Water Operator Need to Know - Ranked by Priority Within Each Knowledge Area

I. Chlorination/Disinfection

- Knowledge of disinfection concepts and procedures (e.g., chlorine contact time, residual, demand, dosage)
- Knowledge of the pH/temperature relationship in the chlorine disinfection process
- Skill to replace chlorine cylinders and adjust gas chlorinators
- Knowledge of water-borne diseases
- Knowledge of the difference between disinfection and sterilization
- Knowledge of off-gas equipment and procedures
- Knowledge of ultraviolet treatment processes
- Knowledge of ozone generation and treatment practices

II. Distribution & Pumping

- Knowledge of pipe disinfection and de-chlorination procedures for new installations and repairs
- Knowledge of Kansas One Call (e.g., 1-800-DIG-SAFE)
- Knowledge of water-related professional ethics (e.g., reporting honest and accurate test results)
- Skill to locate buried utilities and pipes
- Skill to detect water leaks
- Knowledge of the different types of pumps (e.g., centrifugal, submersible, vertical turbines, positive displacement) and motor/pump combinations
- Knowledge of pipe fittings and joining methods
- Skill to perform hydrant flow testing
- Knowledge of chlorine dioxide
- Knowledge of engineering drawings and maps
- Knowledge of cathodic protection and corrosion control processes
- Skill to inspect and/or replace pumps
- Knowledge of different types of pipe joints and restraint systems
- Knowledge of piping materials (e.g., type and size)
- Skill to install and repair buried pipe

III. Laboratory/Chemistry

- Knowledge of proper application of chemicals
- Skill to recognize abnormal analytical results
- Skill to prepare chemicals
- Knowledge of chemistry as it applies to water treatment
- Knowledge of biological science as it applies to water treatment
- Knowledge of source and finish water characteristics
- Knowledge of measuring instruments
- Knowledge of carbonate and non-carbonate hardness and other hardness-causing compounds

- Knowledge of laboratory techniques
- Knowledge of normal chemical range
- Knowledge of Standard methods (e.g., laboratory standards and procedures)
- Knowledge of laboratory equipment

IV. Management, Source Water Protection and Cross Connection

- Knowledge of cross-connection control and approved backflow methods and devices
- Knowledge of emergency plans
- Knowledge of potential causes and impacts of disasters in a facility
- Knowledge of potential causes and impact of system disasters
- Skill to perform impact assessments (i.e, consequences of actions)
- Knowledge of quality control/quality assurance practices
- Skill to coordinate emergency response with organizations
- Skill to organize information
- Skill to translate technical language into common terminology
- Knowledge of risk management
- Skill to communicate in writing
- Knowledge of the principles of supervision
- Knowledge of the principles of public relations
- Skill to assess the likelihood of a disaster occurring
- Knowledge of fire flow requirements needed by your local fire department
- Knowledge of watershed or well-head protection
- Knowledge of local codes and ordinances
- Skill to generate a written safety program
- Skill to evaluate employee performance
- Knowledge of customer service and public participation process
- Skill to develop a budget
- Skill to evaluate proposals
- Knowledge of the principles of management
- Knowledge of technical, financial, and managerial practices
- Skill to conduct trainings
- Skill to generate short- and long-term capital improvement plans
- Skill to conduct meetings
- Skill to write policies and procedures
- Knowledge of the principles of finance
- Skill to develop a staffing plan

V. Math

- Skill to perform math function (e.g., addition, subtraction, multiplication, division, fractions, percentages, formulas, volume, area, detention time)
- Skill to calculate dosage rates
- Knowledge of the principles of measurement (e.g., flow, volume, area, velocity, performance, analytical)
- Skill to perform laboratory calculations

- Skill to perform process control calculations
- Skill to measure chemical weight/volume

VI. Operation & Maintenance

- Skill to discriminate between normal and abnormal conditions
- Knowledge of system operation and maintenance
- Skill to adjust chemical feed rates
- Skill to maintain processes in normal operating condition
- Skill to perform physical measurements
- Skill to evaluate facility performance
- Skill to adjust equipment
- Skill to perform general maintenance and repairs
- Skill to monitor mechanical equipment
- Knowledge of operation and maintenance practices
- Skill to evaluate operation of equipment
- Skill to follow written procedures
- Skill to interpret Material Safety Data Sheets
- Skill to communicate verbally
- Skill to diagnose/troubleshoot process components
- Skill to discriminate between normal and abnormal equipment conditions
- Skill to evaluate and troubleshoot processes
- Knowledge of hydraulic principles
- Knowledge of water aesthetics such as color, taste and odor, staining, and scale formation
- Skill to differentiate between preventative and corrective maintenance
- Skill to monitor electrical equipment
- Skill to use hand tools
- Skill to interpret data
- Skill to review reports
- Skill to determine what information needs to be recorded
- Knowledge of flow measurement devices (e.g., Venturi, Pitot, flow meter)
- Knowledge of hydrology as it applies to water supply
- Knowledge of lubricant and fluid characteristics
- Knowledge of pneumatics
- Knowledge of normal characteristics of water
- Knowledge of mechanical equipment
- Knowledge of function of tools
- Skill to order necessary spare parts
- Knowledge of electrical principles

VII. Operations Groundwater

- Knowledge of well construction and maintenance

VIII. Operations Surface Water

- Knowledge of facility operation and maintenance
- Knowledge of proper chemical handling and storage
- Knowledge of water treatment processes
- Skill to diagnose, troubleshoot, evaluate, and adjust system components
- Skill to calibrate instruments
- Skill to record information and data
- Skill to adjust flow patterns
- Skill to adjust process components
- Knowledge of process control instrumentation
- Knowledge of testing instruments
- Knowledge of monitoring instruments
- Knowledge of start-up and shut-down procedures
- Knowledge of the "point of entry"
- Knowledge of water treatment design parameters

IX. Safety

- Skill to operate safety equipment
- Skill to select safety equipment
- Skill to identify fire and safety hazards (e.g., electrical, chemical, traffic)
- Skill to recognize unsafe work conditions
- Knowledge of proper safety procedures
- Knowledge of personal protective equipment
- Skill to demonstrate safe work habits
- Knowledge of safety regulations (e.g., OSHA, KDHR)

X. Sampling, Recordkeeping, Reporting & Regulatory

- Knowledge of federal, state, and local regulations pertaining to water systems
- Knowledge of monitoring requirements
- Skill to report findings
- Knowledge of proper sampling procedures
- Knowledge of the Safe Drinking Water Act
- Skill to identify potential safety hazards
- Knowledge of public notification requirements
- Skill to apply regulations
- Knowledge of the regulatory inspection process
- Knowledge of reporting requirements
- Knowledge of recordkeeping policies
- Knowledge of water-related carcinogens
- Knowledge of primary and secondary drinking water standards
- Knowledge of the function of a recordkeeping system