Texas Commission on Environmental Quality

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Curriculum Guidance for Water and Wastewater Operator Training Course Titles and Descriptions

The purpose of this curriculum guidance is to promote consistency in the name and content of the training courses required for operator licensing. All training for operator licensing must be reviewed and approved as described in the regulatory guidance document RG-373: *Approval of Training for Occupational Licensing*. Copies are available on the Internet at http://www.tceq.texas.gov/publications/rg/rg-373.html/at_download/file .

TRAINING COURSES FOR WATER OPERATORS

Basic Water Works Operation

A required course for entry-level operators, this basic course in water works operation introduces the student to the relationship between safe potable (drinking) water and health, and the important role that the water operator plays in maintaining adequate safe drinking water supplies. An overall view of the water cycle and a general description of the responsibilities of water system personnel are provided. A summary of Texas' rules for licensing of water system operators and the need for regulation of drinking water to protect the public health, safety, and welfare are included. The course contains a general introduction to the source, characteristics, production, treatment, disinfection, storage, and distribution of potable water with instructions on general hazards and safety practices. Basic water chemistry and math skills are developed and applied to chemical feeding and other operational activities.

Groundwater Production

Course includes the following: a brief review of the water cycle, a general description of the responsibilities of water system personnel, and the need for regulation of the water utility industry to protect the public health, safety, and welfare are presented. A brief summary of Texas' rules for licensing of water system operators are included as well as a discussion of the federal Safe Drinking Water Act and recommended secondary constituent levels. Major topics include the origins and source of groundwater; physical and chemical characteristics of groundwater; groundwater treatment; disinfection; hydraulics; well location considerations; well construction; pumps and motors; well problems and maintenance; storage and distribution; safety; and records, maps and reports. Math skills are reviewed and applied to specific problems of water pumping, disinfection, storage, and distribution.

Surface Water Production I

The first of two courses required for Class D water operators to become Class C surface water operators gives students an understanding of the importance of safe drinking water in public health protection. It includes a review of waterborne illnesses, the need for source water management and process optimization, and then goes into detailed discussion of pretreatment, coagulation, flocculation, sedimentation, filtration, disinfection and disinfection byproducts, and storage prior to distribution. It emphasizes throughout the importance of recordkeeping, quality control and quality assurance, equipment calibration, and safe operational practices. The course includes instructor demonstration of routine tests such as pH, temperature, and chlorine residual and a hands-on laboratory for analysis of turbidity, alkalinity, chlorine residual, ammonia, and total hardness, including the jar test procedure. This course is a pre-requisite for Surface Water Production II.

Surface Water Production II

This course continues the discussion on source water management and process optimization techniques. It includes special treatment processes for taste and odor control, water stabilization, iron and manganese control, lead and copper control, fluoridation, and lime softening. SCADA, the surface water treatment rule, and hands-on laboratory analysis for ammonia and total hardness are included. Recordkeeping requirements for the laboratory and treatment plant are described. The course concludes with a discussion on performance initiatives.

Water Distribution

A brief review of the water cycle is presented together with a general description of the responsibilities of water system personnel and the need for regulation of the water utility industry to protect the public health, safety, and welfare. Texas' rules and regulations for licensing of water system operators are included. The source, characteristics, production, treatment, and disinfection of potable water are presented together with a more detailed description of water storage, pumping, and distribution. Major topics include safety; distribution hydraulics; water mains and services; valves and hydrants; storage; pumps and motors; meters and services; construction practices; operation and maintenance; and public relations. Math skills are reviewed and applied to specific problems of water pumping, storage, and distribution.

Water Laboratory

A general course in water laboratory includes chemical nomenclature; laboratory safety; description of glassware, chemicals, lab equipment, and instrumentation; quality assurance; and flow measurement and sampling. Analytical procedures are presented for specific tests such as hydrogen ion concentration (pH), alkalinity, total hardness, chlorine demand, chlorine residual, fluoride, carbon dioxide, turbidity, ammonia and nitrogen compounds, total coliforms, total organic carbon, and jar tests. Math skills are reviewed and applied to specific problems of chemical dosage and other chemical calculations.

Customer Service Inspector's Course

A course for water system service inspectors introducing the important aspects of the Safe Drinking Water Act and various other federal, and state laws, codes, rules and regulations relating to the prevention of contamination of public water supplies. The objectives of the training course are to:

- develop an increased awareness of the public health issues resulting from cross-connections and lead in water supply systems,
- explain current legislative and regulatory requirements that must be implemented by water systems,
- provide specific information about the responsibilities of water system personnel,
- provide guidance on how to structure and implement an effective cross-connection control program, and
- prepare individuals to receive a license to conduct customer service inspection certifications.

TRAINING COURSES FOR WASTEWATER OPERATORS

Basic Wastewater Operations

An introductory course in wastewater collection and treatment that includes a brief review of the water cycle together with a general description of the responsibilities of wastewater system personnel and the need for regulation of wastewater dischargers to protect receiving steams and the public health, safety, and welfare. Texas' rules and regulations for licensing of wastewater system operators are included. Major topics include the general goals of wastewater collection and treatment; the objectives of state and federal regulations and requirements; the source and general characteristics of wastewater; an introduction to preliminary, primary, and aerobic secondary treatment technologies; sampling and laboratory testing procedures; aerobic and anaerobic sludge digestion; disinfection and reuse of effluent; disposal of biosolids; and attendant hazards and general safety practices. Basic wastewater chemistry and math skills are developed and applied to chemical dosage and other operational problems.

Wastewater Treatment

A comprehensive course in wastewater treatment that includes a brief review of the water cycle together with a general description of the responsibilities of wastewater system personnel and the need for regulation of wastewater dischargers to protect receiving streams and the public health, safety, and welfare. Texas' rules and regulations for licensing of wastewater system operators are included. Major topics include a brief review of the general characteristics and sources of wastewater; an in-depth analysis of the various modes of aerobic secondary treatment technology; sampling and laboratory testing procedures; process control of activated sludge; aerobic and anaerobic sludge digestion; stabilization and reuse or disposal of biosolids; disinfection and disposal or reuse of treated effluent; attendant hazards and general safety practices; and wastewater system management. Math skills are reviewed and applied to specific problems related to wastewater treatment, solids treatment and disposal or reuse, and effluent disinfection and disposal or reuse.

Wastewater Collection

A comprehensive course in wastewater collection that includes a brief review of the water cycle together with a general description of the responsibilities of wastewater system personnel and the need for regulation of the wastewater dischargers to protect receiving streams and the public health, safety, and welfare. Texas' rules and regulations for licensing of wastewater system operators are included. A brief review of the general goals of wastewater collection and treatment; the objectives of state and federal regulations and requirements; and the source and general characteristics of wastewater; followed by an in-depth study of the design, materials of construction, and construction practices for wastewater collection systems, lift stations, and force mains; maintenance and operation of collection systems; industrial waste monitoring and control; attendant hazards and general safety practices; and collection system management. Math skills are reviewed and applied to specific problems related to wastewater hydraulics and pumping.

Wastewater Laboratory

A general course in wastewater laboratory including chemical nomenclature; laboratory safety; description of glassware, chemicals, lab equipment, and instrumentation; quality assurance, flow measurement and sampling. Analytical procedures are presented for specific tests such as hydrogen ion concentration (pH), chlorine residual (Cl_2), dissolved oxygen (DO), biochemical oxygen demand (BOD), solids inventory and balance, ammonia (NH_3), and fecal coliform. Basic wastewater chemistry and math skills are developed and applied to chemical feeding and other operational problems.

TRAINING COURSES FOR BOTH WATER AND WASTEWATER OPERATORS

Operation and Maintenance of Pumps and Motors

A general course in operation and maintenance of water and wastewater pumps and motors including descriptions of various types, applications, and factors affecting selection of pumps and motors; electric power transmission, instrumentation and controls; proper installation and alignment; proper maintenance, installation and/or replacement of bearings, packing, and mechanical seals; planning and scheduling of maintenance work; selection, storing, and application of lubricants; hand tools; safety; maintenance budgeting and cost control. Math skills are reviewed and applied to specific problems related to both water and wastewater hydraulics and pumping.

Valve and Hydrant Maintenance

A training course for maintenance personnel and operators of water and wastewater systems including explanations of the purpose and function of various types of gates, valves, and fire hydrants while providing examples of each. It includes a discussion of the types of tools and equipment needed to maintain them along with their storage and care. It provides an understanding of the importance of regularly-scheduled maintenance activities and emphasizes the safety hazards associated with the operation and maintenance of these types of devices.

Water Utility Calculations

A comprehensive review of basic mathematical concepts including order of operation, fractions, decimals, ratios and proportions, percentages, exponents, square roots, areas of two-dimensional surfaces, and three-dimensional surface areas and volumes. Math applications for both water and wastewater laboratory, electrical, pump and motor, hydraulics, treatment, and disposal calculations are included.

Water Utility Safety

A comprehensive safety course for water utility workers including an introduction to safety concepts and safety programs, the "Right to Know" law, chemical safety, first aid, description and use of personal protective equipment, confined space safety, excavating and trenching safety, biological hazards, electrical safety, work site protection, and safe use of vehicles and other equipment.

Water Utility Management

This is a comprehensive course in water utility management including industry-specific discussions on the following topics to transition operators to management: management functions, communication, decision-making, delegation, goal/objective setting and time management, organizational structure, job classifications and interviews, personnel policies, new employee orientation, job performance reviews, motivation, leadership, discipline and personnel problems, public relations/public education, facility record keeping and reporting, budgeting and basic financial management, ethics, interaction with governmental entities, contracting professional services, safety program considerations, work force education and training, emergency preparedness plans, emergency/disaster planning, system security, and community right-to-know.

Backflow Prevention Assembly Testing

This course is a comprehensive introduction to the theory and principles of backflow prevention and cross-connection control along with recognition of the rules, codes, regulations, statutes, and ordinances affecting BPAT testers and water purveyors. The course includes hands-on testing practice using the most current University of Southern California Foundation for Cross-connection Control and Hydraulic Research test procedures and the basics of backflow prevention assembly repair. The course includes both a written exam and a performance exam over the test procedures to test each student's knowledge and understanding of the course objectives.