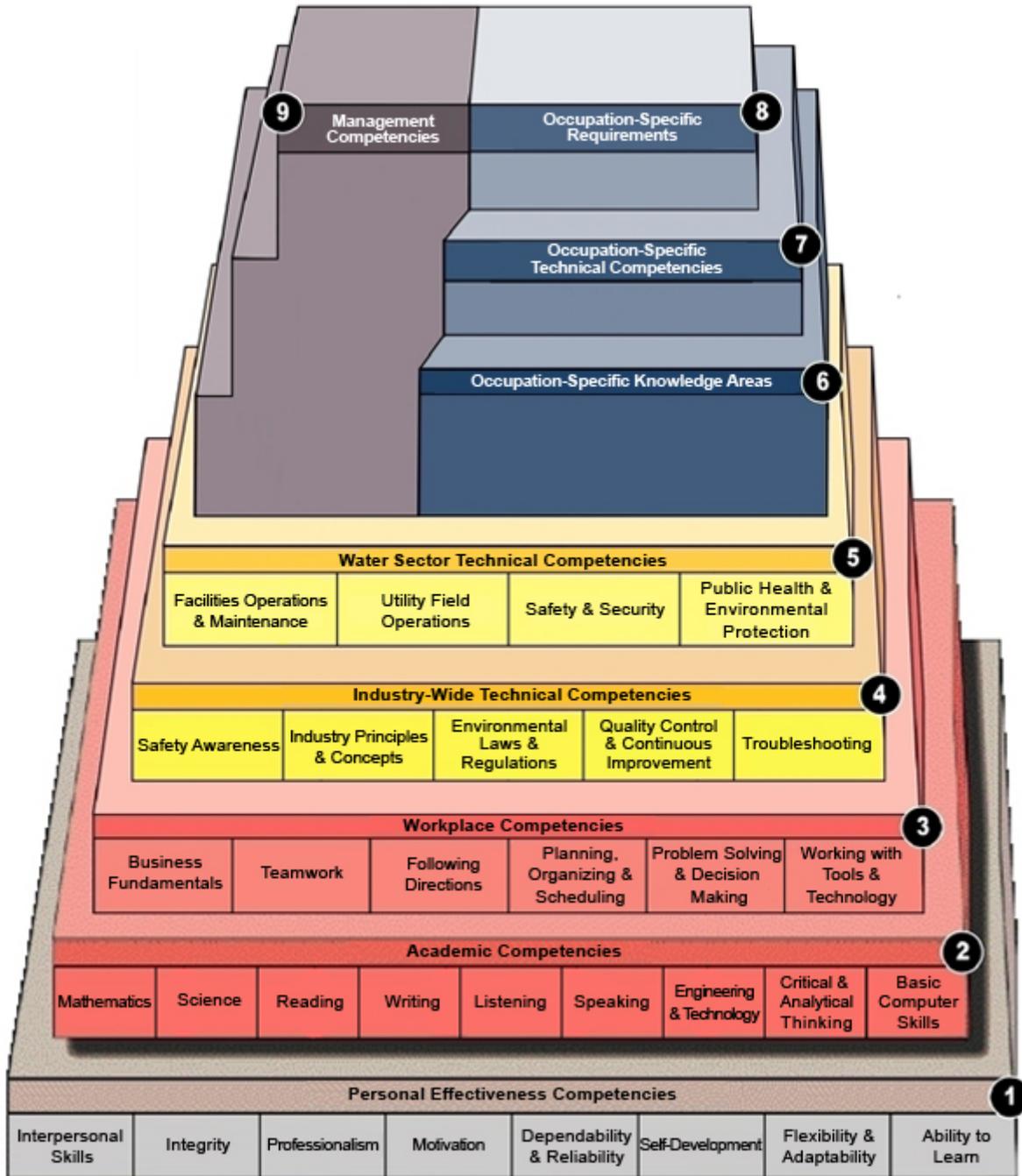


# Water Sector Competency Model



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## ABOUT THE MODEL

The Water Sector Competency Model is depicted in a pyramid graphic with nine tiers. This shape illustrates how occupational and industry competencies build on a foundation of personal effectiveness, academic, and workplace competencies. Each tier is comprised of blocks representing the skills, knowledge, and abilities essential for successful performance in the water sector. At the base of the model, the competencies apply to a large number of industries. As a user moves up the model, the competencies become industry and occupation specific. However, the graphic is not intended to represent a sequence of competency attainment or suggest that certain competencies are of greater value than others. The graphic is accompanied by a table which contains definitions and associated key behaviors for each competency block.

Tiers 1 through 3 contain Foundation Competencies, which form the foundation needed to be ready to enter the workplace.

Tier 1 - Personal Effectiveness Competencies are shown as hovering below the pyramid because they represent personal attributes or “soft skills” that may present some challenges to teach or assess. Essential for all life roles, personal effectiveness competencies generally are learned in the home or community and reinforced at school and in the workplace.

Tier 2 - Academic Competencies are critical competencies primarily learned in a school setting. They include cognitive functions and thinking styles that are likely to apply to most industries and occupations.

Tier 3 - Workplace Competencies represent motives and traits, as well as interpersonal and self-management styles. They generally are applicable to a large number of occupations and industries.

Tiers 4 and 5, called Industry Competencies, show competencies that are specific to the *industry or industry sector*. The cross-cutting industry-wide technical competencies make it possible to show career lattices within an industry wherein a worker can move easily across industry sub-sectors. As a result, this model supports the development of an agile workforce, rather than narrowly following a single occupational career ladder.

Tier 4 - Industry-Wide Technical Competencies represent the knowledge and skills that are common across sectors within a broader industry. These technical competencies build on, but are more specific than, competencies represented on lower tiers.

Tier 5 - Industry-Sector Technical Competencies represent a sub-set of industry technical competencies that are specific to an industry sector.

Tiers 6 through 9 represent the specialization that occurs within specific *occupations* within an industry. Information on occupational competencies is available through O\*NET OnLine (<http://online.onetcenter.org/>).

**Competency** – A cluster of related knowledge, skills, and abilities that affects a major part of one’s job (a role or responsibility), that correlates with performance on the job, that can be measured against well-accepted standards, and that can be improved via training and development.

## Tier 1: Personal Effectiveness Competencies

<b>1. Interpersonal Skills: Displaying skills to work with people.</b>
<ul style="list-style-type: none"><li>• Demonstrates concern for others by being sensitive to their needs and feelings</li><li>• Shows understanding of others behavior by demonstrating appropriate responses</li><li>• Demonstrates respect for the opinions, perspectives, customs, and individual differences of others by including others in problem solving and decision making</li><li>• Maintains open communication with others</li><li>• Recognizes and accurately interprets the verbal and nonverbal behaviors of others</li><li>• Demonstrates flexibility and open mindedness when dealing with a wide range of people</li><li>• Listens to and considers others' viewpoints and alters own opinion when it is appropriate</li></ul>
<b>2. Integrity: Displaying accepted social and work behaviors.</b>
<ul style="list-style-type: none"><li>• Treats all in a fair and equitable manner</li><li>• Behaves ethically through responsible use of company time and property</li><li>• Reports unethical behavior demonstrated by others to supervision</li></ul>
<b>3. Professionalism: Maintaining a professional presence and adhering to ethical standards.</b>
<ul style="list-style-type: none"><li>• Demonstrates self-control by maintaining composure and keeping emotions in check even in difficult situations</li><li>• Maintains a professional appearance by dressing appropriately for the job and maintaining personal hygiene</li><li>• Uses professional language when speaking with supervisor, co-workers, and customers</li><li>• Is free from substance abuse</li><li>• Maintains a positive attitude</li><li>• Takes pride in one's work and the work of the organization</li></ul>
<b>4. Motivation: Demonstrating a commitment to effective job performance.</b>
<ul style="list-style-type: none"><li>• Ensures that job is done safely, accurately, and completely</li><li>• Identifies new and better processes or procedures</li><li>• Follows instructions and direction from supervisor and co-workers</li><li>• Takes responsibility for completing one's own work assignments</li></ul>
<b>5. Dependability &amp; Reliability: Displaying responsible behaviors at work.</b>
<ul style="list-style-type: none"><li>• Comes to work when scheduled and on time</li><li>• Complies with company policies</li><li>• Does not attend to personal business while on the job</li><li>• Manages stressful situations effectively</li><li>• Fulfills obligations of the job</li></ul>
<b>6. Self-Development: Demonstrating a commitment to self development and improvement.</b>
<ul style="list-style-type: none"><li>• Identifies goals and career interests</li><li>• Demonstrates an interest in learning</li></ul>

- Seeks opportunities to learn new skills and tasks
- Participates in training to learn new skills and to refine current skills
- Adapts quickly to changes in process or technology
- Accepts help from supervisors and co-workers

**7. Flexibility & Adaptability: Adjusting to changing work requirements.**

- Adjusts to changing priorities
- Identifies logical stopping points in work
- Refocuses attention to new assignments quickly
- Quickly learns new assignments
- Shifts gears and changes direction when working on multiple projects
- Anticipates and accepts changes in work

**8. Ability to Learn: Incorporating classroom and on the job training into work performance.**

- Uses material taught in classroom and on the job training in work situations
- Applies information provided in training to work tasks
- Desires and shows willingness to learn new assignments, procedures, and technologies

## Tier 2: Academic Competencies

### **1. Mathematics: Using mathematics to solve problems.**

- Adds, subtracts, multiplies, and divides with whole numbers, fractions, decimals, and percents; calculates averages, ratios, proportions, and rates
- Takes measurement of time, temperature, distance, length, width, height, perimeter, etc.
- Correctly converts from one measurement to another
- Translates practical problems into useful mathematical expressions and uses appropriate mathematical formulas and techniques
- Solves simple algebraic equations
- Is able to determine slope, midpoint, and distance
- Calculates perimeters, areas, and volumes of basic shapes and solids
- Reads, tracks, and calculates gauge measurements

### **2. Science: Knowing and applying scientific principles and methods to solve problems.**

- Knows and applies scientific principles:
  - Scientific Method - the systematic pursuit of knowledge involving the recognition and formulation of a problem, the collection of data through observation and experiment, and the formulation and testing of a hypothesis
  - Chemistry - the composition, structure, properties, and reactions of matter, especially of atomic and molecular systems
  - Biology - the structure, function, growth, origin, and classification of living organisms

### **3. Reading: Knowing how to find information and identifying essential information.**

- Sorts through distracting information
- Scans written material for subject of interest
- Is able to identify main ideas in written material
- Correctly interprets written material
- Integrates what is learned from written materials with prior knowledge
- Applies what is learned from the written material to complete specific tasks

### **4. Writing: Using standard business English to write messages to co-workers and reports to managers and associates.**

- Creates documents such as work orders or memos
- Uses standard syntax and sentence structure, correct spelling, punctuation and capitalization, and appropriate grammar
- Writes clearly and concisely in a professional and courteous manner
- Writes effectively for a variety of audiences
- Communicates thoughts, ideas, and information which may contain technical material in a logical, organized, and coherent manner
- Clearly develops ideas and elaborates on them with relevant supporting examples and specific details

<ul style="list-style-type: none"> <li>• Shows insight, perception, and depth in writing</li> </ul>
<b>5. <u>Listening</u>: Listening carefully in order to incorporate information into work activities.</b>
<ul style="list-style-type: none"> <li>• Listens carefully to others</li> <li>• Correctly interprets information provided by others</li> <li>• Is able to incorporate information into actions</li> </ul>
<b>6. <u>Speaking</u>: Communicating in spoken English well enough to be understood by supervisors, co-workers, and customers.</b>
<ul style="list-style-type: none"> <li>• Uses standard sentence structure and appropriate grammar</li> <li>• Speaks clearly, in precise language, and in a logical, organized, and coherent manner</li> <li>• Keeps language simple and appropriate for the audience’s level of knowledge of the subject</li> </ul>
<b>7. <u>Engineering &amp; Technology</u>: Possessing an appropriate mastery of knowledge, techniques, skills, modern tools, and advanced technology.</b>
<ul style="list-style-type: none"> <li>• Applies basic engineering principles</li> <li>• Applies the appropriate technical solution</li> <li>• Applies principles of engineering science and technology, techniques, procedures, and equipment to the design and production of various goods and services</li> <li>• Applies the basics of electricity</li> <li>• Identifies and selects the appropriate hand or small electric tools or diagnostic equipment for the work</li> <li>• Solves problems where a variety of mechanical, electrical, thermal, or fluid faults could be the reason for the problem</li> <li>• Familiarity with renewable energy, energy efficiency, green infrastructure, and water efficiency technologies and approaches</li> </ul>
<b>8. <u>Critical &amp; Analytical Thinking</u>: Using logical thought processes to analyze information and draw conclusions.</b>
<ul style="list-style-type: none"> <li>• Identifies inconsistent or missing information</li> <li>• Critically reviews, analyzes, synthesizes, compares, and interprets information</li> <li>• Draws conclusions from relevant and/or missing information</li> <li>• Tests possible hypotheses to ensure the problem is correctly diagnosed and the best solution is found</li> </ul>
<b>9. <u>Basic Computer Skills</u>: Using a computer and related applications to input and retrieve information.</b>
<ul style="list-style-type: none"> <li>• Navigation and File Management <ul style="list-style-type: none"> <li>○ Uses scroll bars, a mouse, and dialog boxes to work within the computer's operating system</li> <li>○ Accesses and switches between applications and files of interest</li> </ul> </li> <li>• Internet and E-mail <ul style="list-style-type: none"> <li>○ Navigates the Internet to find information</li> <li>○ Opens and configures standard browsers</li> </ul> </li> </ul>

- Uses searches, hypertext references, and transfer protocols
- Sends and retrieves electronic mail (e-mail)
- Writes e-mail with an appropriate tone
- Navigates the internet to find and attend online training, web conferences, webinars, self-paced training, and other applicable interactive sites
- Word Processing
  - Uses a computer application to type text and insert pictures
  - Formats, edits, and prints text
  - Saves and retrieves word processing documents
- Spreadsheets
  - Uses a computer application to enter, manipulate, and format text and numerical data
  - Inserts, deletes, and manipulates cells, rows, and columns
  - Creates and saves worksheets, charts, and graphs
- Presentations
  - Uses a computer application to create, manipulate, edit, and show virtual slide presentations
- Databases
  - Uses a computer application to manage large amounts of information
  - Creates and edits simple databases
  - Inputs data
  - Retrieves detailed records
  - Creates reports to communicate the information
- Graphics
  - Works with graphics programs
  - Creates and interprets simple graphics
  - Inserts graphics into other files/programs

## Tier 3: Workplace Competencies

### **1. Business Fundamentals: Knowledge of business and management principles, and the knowledge and skills that enable individuals to understand the relationship between own job and goals and operations of company and industry.**

- Is able to articulate the organization's mission and functions and its position in the marketplace
- Recognizes one's role in the functioning of the company
- Applies interpersonal skills to work environment
- Complies with applicable laws and rules governing work, and reports loss, waste, or theft of company property to appropriate personnel
- Acts in the best interest of the company, community, and environment
- Conducts procurement activities to ensure acquisition of goods and services at the most affordable cost and meeting requirements of any applicable laws, regulations, or standard practices

### **2. Teamwork: Developed capacities used to work with others.**

- Accepts membership in the team
- Identifies with the goals, norms, values, and customers of the team
- Uses a group approach to identify problems and develop solutions based on group consensus
- Effectively communicates with all members of the team to achieve goals
- Develops constructive and cooperative working relationships with others
- Shows sensitivity to the thoughts and opinions of others
- Responds appropriately to positive and negative feedback
- Encourages others to express their ideas and opinions
- Learns from other team members
- Applies interpersonal skills to help team achieve goals
- Gives full attention to what others are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times
- Keeps all parties informed of progress and all relevant changes to project timelines
- Demonstrates loyalty to the team

### **3. Following Directions: Receiving, understanding, and carrying out assignments with minimal supervision.**

- Receives, interprets, understands, and responds to verbal messages and other cues
- Picks out important information in verbal messages
- Interprets complex instructions and their relevance to the work assignment
- Asks questions to clarify unclear directions
- Acts upon the instruction to complete an assignment

**4. Planning, Organizing & Scheduling: Demonstrating the ability to work within a schedule using prescribed procedures.**

- Prioritizes various competing tasks and performs them quickly and efficiently according to their urgency
- Finds new ways of organizing work area or planning work to accomplish work more efficiently
- Estimates resources needed for project completion; allocates time and resources effectively
- Anticipates obstacles to project completion and develops contingency plans to address them; takes necessary corrective action when projects go off-track
- Plans and schedules tasks so that work is completed on time
- Makes arrangements that fulfill all requirements as efficiently and economically as possible
- Responds to the schedules of others affected by arrangements; informs others of arrangements, giving them complete, accurate, and timely information
- Keeps track of details to ensure work is performed accurately and completely
- Takes steps to verify all arrangements; recognizes problems, generates effective alternatives, and takes corrective action
- Effectively coordinates the transition of employees at the beginning and end of each work shift; disseminates crucial information in an organized manner to rapidly bring employees up to speed at the start of their shifts

**5. Problem Solving & Decision Making: Applying problem-solving and critical-thinking skills to help grow the business and/or to resolve workplace conflict.**

- Anticipates or recognizes the existence of a problem
- Identifies the true nature of the problem by analyzing its component parts
- Effectively uses both internal and external resources to locate and gather information
- Examines information obtained for relevance and completeness
- Recognizes important gaps in existing information and takes steps to eliminate those gaps
- Recalls previously learned information that is relevant to the problem; organizes information as appropriate to gain a better understanding of the problem
- Integrates previously learned and externally obtained information to generate a variety of high quality alternative approaches to the problem
- Skillfully uses logic and analysis to identify the strengths and weaknesses, the costs and benefits, and the short and long-term consequences of different approaches
- Decisively chooses the best solution after contemplating available approaches to the problem; makes difficult decisions even in highly ambiguous or ill-defined situations; quickly chooses an effective solution without assistance when appropriate
- Commits to a solution in a timely manner and develops a realistic approach for implementing the chosen solution; observes and evaluates the outcomes of implementing the solution to assess the need for alternative approaches and to identify lessons learned
- Uses scientific rules and methods to solve problems

**6. Working With Tools & Technology: Having the capability to operate and troubleshoot electric and electronic equipment, mechanical, and electrical products.**

- Selects and applies appropriate tools or technological solutions to frequently encountered problems
- Carefully considers which tools or technological solutions are appropriate for a given job and consistently chooses the best tool or technological solution for the problem at hand
- Demonstrates an interest in learning about new and emerging tools and technologies; seeks out opportunities to improve knowledge of tools and technologies that may assist in streamlining work and improving productivity, energy, and water efficiency
- Knows how to maintain and troubleshoot tools and technologies
- Uses basic computer technology to receive work orders, report progress, and maintain records

## Tier 4: Industry-Wide Technical Competencies

### **1. Safety Awareness: Compliance with the procedures necessary to ensure a safe and healthy work environment.**

- Is cognizant of the environment and potential hazards
- Follows established safety procedures
- Evaluates changes in the environment with respect to their impact on safety of self and others
- Promotes effective local, state, or national security operations for the protection of people, data, property, and institutions
- Complies with safety procedures and proper ways to perform work
- Understands potential threats created by deviation from safety procedures and improper use of tools and equipment
- Follows safety procedures and uses safety equipment as specified by user manuals and safety training
- Uses personal protection equipment including safety glasses, work boots, and hard hats
- Keeps personal safety equipment in good working order
- Uses tools and equipment in compliance with user manuals and training
- Calls attention to potential and actual hazardous conditions as they arise
- Alerts co-workers and supervisory personnel to hazardous conditions and deviations from safety procedures in a timely manner
- Maintains appropriate certification and is knowledgeable in first aid or first response procedures
- Notifies person in charge and/or co-workers of unsafe work conditions
- Stops the job if there are unsafe working conditions

### **2. Industry Principles & Concepts: Knowledge of the basic and emerging principles of the utility industry.**

- Is able to explain investor-owned, municipal, and cooperative business models
- Is able to explain the role of regulators and unions in the industry
- Demonstrates an awareness of the potential uses of new and emerging technologies

### **3. Environmental Laws & Regulations: Compliance with local, state, and federal environmental laws and regulations that impact the utility industry.**

- Demonstrates professional responsibility for maintaining all policies and standards for health, safety, and the environment
- Complies with local, federal, sector, and company environmental laws and regulations
- Maintains current knowledge of regulatory procedures governing operations
- Follows recommendations and standards from industry associations

**4. Quality Control & Continuous Improvement: Demonstrates the ability to design, analyze, and effectively use systems, components, and methods within a framework of quality and continuous improvement.**

- Conducts tests and inspections of products, services, or processes to evaluate quality or performance
- Incorporates new information into both current and future problem solving and decision making
- Monitors/assesses performance of self, other individuals, or organizations to make improvements or take corrective action
- Determines how a system should work and how changes in conditions, operations, and the environment will affect outcomes
- Uses logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions, or approaches to problems

**5. Troubleshooting: Diagnoses and corrects abnormalities and malfunctions in equipment and production processes.**

- Monitors equipment to ensure maintenance schedules are adhered to
- Demonstrates knowledge of normal equipment operation (how the individual pieces of equipment relate to each other) in order to spot potential equipment problems before they occur
- Determines causes of operating errors, decides what to do about them, and knows when to notify more senior personnel

## Tier 5: Water Sector Technical Competencies

### **1. Facilities Operations & Maintenance: Treatment of water and wastewater.**

- Has general knowledge of biology, chemistry, physical science, hydrology, treatment processes, laboratory analysis and processes, safety procedures, water/wastewater systems management/administration, system operation and maintenance, and regulations
- Understands water and/or wastewater treatment concepts and processes and water treatment design parameters
- Evaluates characteristics of source water, including normal characteristics of water and recognizing abnormal systems, compliance inspection processes and watershed/wellhead protection
- Comprehends sludge management procedures and urban water reuse
- Performs laboratory tasks including the collection of samples, interprets the analysis and performs plant processes control analysis
- Understands chemical application, handling, and storage procedures
- Diagnoses and troubleshoots equipment
- Performs start-up and shut-down procedures
- Identifies electrical and hydraulic principles
- Adjusts chemical feed rates, flow patterns, and operation of process units
- Calculates dosage rates, prepares chemicals, and confirms chemical strength
- Performs physical measurements and process control calculations

### **2. Utility Field Operations: Operation and maintenance of water/wastewater system infrastructure.**

- Has general knowledge of electrical and mechanical principles and system infrastructure operations
- Comprehends hydraulic and pneumatic principles, lubricant and fluid characteristics, and use of control systems
- Knowledge of cross connections and approved backflow methods and devices
- Identifies system infrastructure control instrumentation
- Operates, calibrates, maintains, troubleshoots, and diagnoses system infrastructure equipment
- Differentiates between normal and abnormal operating conditions and preventive and corrective maintenance
- Determines the type of equipment needed to do the job
- Performs start-up and shut-down procedures

### **3. Safety & Security: Ensures safety of the public, employees, the facilities, and the system infrastructure.**

- Follows all applicable federal, state, and local regulations/codes/ordinances
- Recognizes potential causes and impacts of abnormal facility conditions
- Conducts proper public health notifications as required
- Assesses risks and likelihood of disasters occurring, including conducting a Vulnerability Risk Assessment and development of an Emergency Response Plan

- Follows the Department of Homeland Security's Chemical Facilities Anti-Terrorism Standards (CFATS) regulation
- Encourages utility participation in the Mutual Aid and Assistance Network for Water and Wastewater Utilities
- Keeps abreast of the latest scientific advances to protect drinking water and wastewater systems
- Utilizes recommendations from industry associations

**4. Public Health & Environmental Protection: Adherence to local, state, and federal laws and regulations and institution of practices that protect public health and the environment.**

- Ensures adherence to all applicable federal, state and local water, wastewater, and bio-solids laws and regulations, including those outlined in the Safe Drinking Water Act, The Clean Water Act and The Code of Federal Regulations and the Environmental Protection Agency Guidance Documents
- Practices sustainability by using processes that ensure the technical, managerial, and financial capacity of the system
- Takes measures to ensure practice of non-polluting activities that conserve energy, water, and resources and are economically efficient, and safe for workers, communities, and consumers
- Demonstrates awareness of the impact of the project's carbon footprint
- Incorporates standards and practices for achieving water and energy efficiency in all aspects of business
- Communicates effectively and in a timely manner with regulatory agencies
- Conducts environmental, water, and energy audits
- Ensures compliance with environmental permits and other applicable documents
- Computes design specifications for implementation of conservation practices
- Recommends water efficiency and conservation techniques to the public
- Utilizes recommendations from industry associations, such as the standards from the American Water Works Association and Methods of Practice from the Water Environment Federation

## Resources Reviewed

Developer	Resource	Link
American Water Works Association	State of the Industry Report, 2007-2008	<a href="http://www.awwa.org/publications/AWWAJournalArticle.cfm?itemnumber=41500">http://www.awwa.org/publications/AWWAJournalArticle.cfm?itemnumber=41500</a>
Association of Boards of Certification	ABC Need-to-Know Criteria	<a href="http://www.abccert.org/testing_services/need_to_know_criteria.asp">http://www.abccert.org/testing_services/need_to_know_criteria.asp</a>
Center for Energy Workforce Development and Employment and Training Administration	Energy/Generation, Transmission and Distribution Competency Model	<a href="http://www.careeronestop.org/competencymodel/pyramid.aspx?NRG=Y">http://www.careeronestop.org/competencymodel/pyramid.aspx?NRG=Y</a>
Florida Department of Education	Water/Wastewater Treatment Curriculum Framework	<a href="http://www.fldoe.org/workforce/dwdframe/ag_cluster_frame09.asp">http://www.fldoe.org/workforce/dwdframe/ag_cluster_frame09.asp</a>
Georgia Water and Wastewater Institute, Inc.	Water Curricula	<a href="http://www.gwwi.org/courses.html">http://www.gwwi.org/courses.html</a>
Get Into Energy	Energy Careers and Skills Information	<a href="http://www.getintoenergy.com/">http://www.getintoenergy.com/</a>
Oregon Department of Education	Knowledge and Skill Statements - Waste Water/Water Quality	<a href="http://www.ode.state.or.us/search/page/?id=929">http://www.ode.state.or.us/search/page/?id=929</a>
Red Rocks Community College	Water Quality Management Program, Course Curriculum & Certificate Requirements	<a href="http://www.rcc.edu/catalogs/09-10InteractiveCatalog.pdf">http://www.rcc.edu/catalogs/09-10InteractiveCatalog.pdf</a>
Water Environment Federation	Skills Builder	<a href="http://www.wef.org/skillsbuilder.aspx?ekmense=c583fa7b_32_0_85_1">http://www.wef.org/skillsbuilder.aspx?ekmense=c583fa7b_32_0_85_1</a>