CEU TRAINING COURSE DESCRIPTION

WATER TREATMENT 303 COURSE- 24 Hours

This distance learning CEU training course will examine various aspects of conventional water treatment methods, understanding pathogens, understand the disinfection process, and review federal drinking water rules and regulations. This course will also cover water treatment pumps and motors. This course was designed to provide continuing education credit to water treatment operators.

Water Distribution, Well Drillers, Pump Installers, Water Treatment Operators, Water Treatment Specialists and Customer Service Personnel are welcomed to take this course. The target audience for this course is the person interested in working in a water treatment or distribution facility and/or wishing to maintain CEUs for a certification license or to learn how to do the job safely and effectively and/or to meet education needs for promotion.

Task Analysis and Training Needs Assessments have been conducted to determine or set Needs-To-Know for this CEU course. The following is a listing of some of those who have conducted extensive valid studies from which TLC has based this program upon: the Environmental Protection Agency (EPA), the Arizona Department of Environmental Quality (ADEQ), the Texas Commission of Environmental Quality (TCEQ) and the Association of Boards of Certification (ABC).

Primary Learning Objectives

1. The student will be able to understand and describe the Water Treatment process and various components.
2. Understand and describe various Water Treatment Chemicals.
3. Understand and describe the Water Production processes and various components.
4. Understand and describe various Membrane Filtration Processes and Hard Water.
5. Understand and explain Water Quality concerns associated with water treatment.
6. Understand and describe the disinfection process and explain how Chlorine disinfects and understand various Chlorine processes.
7. Understand and explain various water treatment Pumps, Motors and Hydraulics.
8. Understand and describe various Backflow and Cross-Connection terms.
9. Understand and describe various Water Distribution and Water delivery methods.
10. Understand and describe various waterborne diseases.

Specific CEU Course Learning Objectives

Knowledge obtained by this CEU Course and the approximately average times the student will spend on each subject. This includes assignment reading, glossary review, pre-examination and final examination.

Topic 1- Water Treatment Introduction Section

Section Focus: You will learn the basics of conventional water treatment. At the end of this section, you the student will be able to understand and describe the water treatment process. There is a post quiz at the end of this section to review your comprehension and a final examination in the Assignment for your contact hours.

Scope/Background: The Safe Drinking Water Act (SDWA) requires the EPA to set enforceable standards to protect public health from contaminants which may occur in drinking water, therefore we need drinking water treatment.

Water Treatment Section
Preliminary Treatment – O&M
Pre-sedimentation - O&M
Flights and Chains– O&M
Pre-Treatment– O&M
Flocculation & Coagulation-WQ and O&M
Chemical Treatment – O&M
Solids-Solutions Reactions -WQ and O&M
Coagulation Purpose-WQ and O&M
Coagulants-WQ and O&M
Coagulation Factors-WQ and O&M
Corrosion Control-WQ and O&M
Summary
Post Quiz

Topic 2- Water Treatment Filtration Section
Section Focus: You will learn the basics of conventional water treatment filtration. At the end of this section, you the student will be able to understand and describe the water treatment filtration process. There is a post quiz at the end of this section to review your comprehension and a final examination in the Assignment for your contact hours.
Scope/Background: The Safe Drinking Water Act (SDWA) requires the EPA to set enforceable standards to protect public health from contaminants which may occur in drinking water, therefore it is necessary to understand proper water filtration.
Filtration Section
Filtration Key Terms –TECH
Types of Filters– O&M
Filtration Step – TECH & O&M
Rapid Sand– O&M
Backwash Rule- CRAO
Conventional Treatment Overview -TECH
Filtration Process– O&M
Surface Wash– O&M
Pressure Filters– O&M
Filtration Operation –O&M and WQ
Backwash Process-WQ and O&M
Chemical Treatment – TECH & O&M &WQ
Water Treatment Chemicals –TECH
Post Quiz

Topic 3 -Advanced Water Treatment Section
Section Focus: You will learn the basics of dealing with hard water, related issues and advanced water treatment methods. At the end of this section, you the student will be able to understand and describe various treatment methods including Microfiltration and Reverse Osmosis to alternative disinfection methods. There is a post quiz at the end of this section to review your comprehension and a final examination in the Assignment for your contact hours.
Scope/Background: Water contains Endocrine-Disrupting Compounds (EDCs), contaminants and various amounts of dissolved minerals, some of which impart a quality known as hardness. It is necessary for many water treatment facilities to treat these concerns without conventional water treatment methods. EPA has promulgated many rules and regulations as a result of the SDWA that require drinking water utilities to meet specific guidelines and numeric standards for

water quality, some of which are enforceable and collectively referred to as maximum contaminant levels (MCLs).

Advanced Water Treatment Section

Hard Water -CRAO and WQ
Hard Water Expression –TECH & WQ
Types of Water Hardness –TECH & WQ
Ion Exchange –TECH & WQ
Membrane Filtration Section - WQ and O&M
Membrane Configurations - WQ and O&M
Electrodialysis –TECH & WQ
Osmotic Processes–TECH & WQ
Desalination–TECH & WQ
Reverse Osmosis Section- WQ and O&M
GAC PAC- WQ and O&M
Alternative Disinfectants –TECH & DISN
Ozone –TECH & DISN & O&M
Ultraviolet Radiation –TECH & DISN & O&M Summary
Post Quiz

Topic 4 - Water Quality Section Introduction

Section Focus: You will learn the basics of the EPA's Safe Water Drinking Act and the reasons why we need to ensure the water means federal standards. At the end of this section, you the student will be able to understand and describe EPA's Primary and Secondary standards. There is a post quiz at the end of this section to review your comprehension and a final examination in the Assignment for your contact hours.

Scope/Background: EPA identifies contaminants to regulate in drinking water to protect public health. The Agency sets regulatory limits for the amounts of certain contaminants in water provided by public water systems. These contaminant standards are required by the Safe Drinking Water Act (SDWA). Drinking water standards may apply differently based on type and size of public water systems.

Water Quality Section

Raw Water Introduction
Safe Drinking Water Act – CRAO
Source Water Protection – CRAO
MCL Introduction – CRAO
Inorganic Contaminants – CRAO
IESWTR – CRAO
Arsenic – CRAO
Sampling Plan Introduction – CRAO
Disinfection Rules Stages 1 and 2– CRAO
Primary Drinking Water Regulations – CRAO
Secondary Drinking Water Regulations – CRAO
Chemical Monitoring – CRAO
QA/QC Measures – CRAO
Drinking Water Analysis Chart – CRAO
Volatile Organic Chemicals – CRAO
Post Quiz

Topic 5- Bacteriological Monitoring Section

Section Focus: You will learn the basics of the EPA's Total Coliform Rule and bacteriological sampling. At the end of this section, you the student will be able to understand and describe the Total Coliform Rule. There is a post quiz at the end of this section to review your comprehension and a final examination in the Assignment for your contact hours.

Scope/Background: The Environmental Protection Agency (EPA) published the Revised Total Coliform Rule (RTCR) in the Federal Register (FR) on February 13, 2013 (78 FR 10269) and minor corrections on February 26, 2014 (79 FR 10665). The RTCR is the revision to the 1989 Total Coliform Rule (TCR) and is intended to improve public health protection.

Introduction

Total coliforms are a group of related bacteria that are (with few exceptions) not harmful to humans. A variety of bacteria, parasites, and viruses, known as pathogens, can potentially cause health problems if humans ingest them. EPA considers total coliforms a useful indicator of other pathogens for drinking water.

Bacteriological Monitoring Section

TCR Provisions – CRAO&WQ
Related Microbes – CRAO
Bacteriological Monitoring – CRAO
Types of Samples – CRAO
Coliform Present – CRAO
Heterotrophic Plate Count – CRAO
Total Coliforms– CRAO
Pathogens – CRAO
Viral Diseases – CRAO
Microbial Contaminants – CRAO
Chain of Custody– CRAO
Collection of Surface Samples– CRAO&WQ
Total Coliform Rule Summary– CRAO&WQ
Post Quiz

Topic 6 - Water Laboratory Analysis Section

Section Focus: You will learn the basics of the water laboratory and related water quality analysis/procedures. At the end of this section, you the student will be able to understand and describe water analytical methodologies, i.e., pH, DO, turbidity, Jar Testing, etc. and related lab reports. There is a post quiz at the end of this section to review your comprehension and a final examination in the Assignment for your contact hours.

Scope/Background: Laboratory analysis of water quality refers primarily to the chemical, physical, biological, and radiological characteristics of water. It is a measure of the condition of water relative to compliance or process control requirements. Laboratory analysis is frequently used by reference to a set of standards against which compliance, generally achieved through treatment of the water, can be assessed.

Water Laboratory Procedures

Water Quality Factors Introduction– CRAO&WQ
pH Section – CRAO&WQ
pH Testing – CRAO&WQ
pH Definitions and Measurements – CRAO&WQ
Calculations of pH – CRAO&WQ
Acids and Bases – O&M and WQ
Jar Testing Specific– O&M and WQ
Measuring Turbidity – O&M and WQ
Preparing Polymers – O&M and WQ

Potassium Permanganate – O&M and WQ
Alkalinity Testing – O&M and WQ
Alkalinity Total– CRAO&WQ&O&M
Fluorides – CRAO&WQ&O&M
Dissolved Oxygen– CRAO&WQ&O&M
Total Dissolved Solids– CRAO&WQ&O&M
Ozone Testing – O&M and WQ
Post Quiz

Topic 7- Chlorination Section

Section Focus: You will learn the basics of water disinfection with an emphasis on Chlorine. At the end of this section, you the student will be able to understand and describe chlorination. There is a post quiz at the end of this section to review your comprehension and a final examination in the Assignment for your contact hours.

Scope/Background: Traditionally, the use of chlorine gas was the most common method of water disinfection. Chlorine gas itself is relatively inexpensive but is a highly toxic chemical that must be transported and handled with extreme caution. It is stored under pressure in large tanks and is released into the water as a gas. Sodium hypochlorite is a diluted liquid form of chlorine that is also commonly used, primarily in the wellfield.

Chlorine Introduction

Chlorine gas is the most widely used water disinfectant in the U.S., and it kills most bacteria, viruses, and other microorganisms that cause disease. Chlorine is introduced to water in the form of gas, hypochlorites (tablets, solutions, or powder), and other compounds. The different forms of chlorine used at water treatment plants are gaseous chlorine, sodium hypochlorite solution, calcium hypochlorite, and bromium chloride.

Chlorine Section

Gas Introduction - O&M -DISN
Chemistry of Chlorination- O&M -DISN
Using DPD - O&M -DISN
DDBPs- O&M –DISN-CRAO
Risks and Benefits of Chlorine - O&M –DISN-CRAO- SAFETY
Chlorination Equipment - O&M –DISN- SAFETY
Chlorine Leak Detection - O&M –DISN- SAFETY
Chlorinator Parts- O&M –DISN- SAFETY
Amperometric Titration –WQ-DISN
Chlorine Dioxide - O&M –DISN- SAFETY
Chlorine Review- O&M –DISN- SAFETY
Fluoride- O&M
Post Quiz

Topic 8 - Pumps and Motors Section

Section Focus: You will learn the basics of hydraulics, with a study into various pumps and motors. At the end of this section, you the student will be able to understand and describe water pumps and motors and the associated hydraulic principles that are found in water treatment production. There is a post quiz at the end of this section to review your comprehension and a final examination in the Assignment for your contact hours.

Scope/Background: The main purpose of this section is to provide understanding of various water lifting procedures, basic pump fundamentals, hydraulic principles, theory, maintenance, related electrical and motor principles.

Pump, Motors and Hydraulic Section

Hydraulic Terms –O&M -TECH

Hydraulic Principles –O&M -TECH
Atmospheric Pressure –O&M -TECH
Pressure –O&M -TECH
General Pumping Fundamentals –O&M -TECH
Pump Definitions –O&M -TECH
Types of Pumps –O&M -TECH
Pump Categories–O&M -TECH
Three Types of Pumps–O&M -TECH
Submersible Pump –O&M -TECH
Vertical Turbine Section –O&M -TECH
Centrifugal Pump Section –O&M -TECH
Motors Section –O&M -TECH
Motor Controls –O&M -TECH
Coupling Section –O&M -TECH
Mechanical Seals –O&M -TECH
Maintenance–O&M -TECH
Troubleshooting Pumps–O&M -TECH
Post Quiz

Topic 9- Water Distribution Section

Section Focus: You will learn the basics of the water distribution system and cross-connection protection. Much of this section will also apply to the water treatment plant, for much of the same piping and valves are utilized at the plant. At the end of this section, you the student will be able to understand and describe how treated water is delivered to the customer. There is a post quiz at the end of this section to review your comprehension and a final examination in the Assignment for your contact hours.

Scope/Background: The following EPA drinking water regulations pertain to distribution systems:

- Surface Water Treatment Rules (disinfectant residual and sanitary survey requirements)
- Stage 1 and 2 Disinfectants and Disinfection Byproducts Rules (DBPR) (monitoring for DBPs in the distribution system)
- Ground Water Rule (sanitary surveys)
- Revised Total Coliform Rule (monitoring for bacterial contamination in distribution systems)

Water Distribution Section

Distribution Valve Section–O&M -TECH
Distribution Design –O&M -TECH
Common Rotary Valves –O&M -TECH
Needle Valves –O&M -TECH
Butterfly –O&M -TECH
Actuators and Control Devices –O&M -TECH
Pressure Reducing Valve –O&M -TECH
Service Connections –O&M -TECH
System Layouts –O&M -TECH
Types of Pipes –O&M -TECH
Joints and Fittings –O&M -TECH
Water Main Installation –O&M -TECH
Troubleshooting Distribution–O&M -TECH
Water Storage –O&M -TECH
Backflow Sub-Section

Cross-Connection Terms–O&M -TECH
Backpressure–O&M -TECH
Backflow Responsibility–O&M -TECH
Methods and Assemblies–O&M -TECH
Post Quiz

Topic Legend

This CEU course covers several educational topics/functions/purposes/objectives of conventional and/or advanced water treatment, filtration processes, bacteriological monitoring and regulatory compliance. The topics listed below are to assist in determining which educational objective or goal is covered for a specific topic area:

CRAO: The regulatory and compliance component. May be a requirement of the SDWA act or State Regulations, i.e. Compliance, non-compliance, process control related sampling or other drinking water related requirement. This EPA information is to satisfy the regulatory portion of your operator training. O&M or laboratory training requirement for many operators.

DISINFECTION (DISN): This area covers plant disinfection procedures. Part of O&M training for many operators. May include alternative disinfection procedures, i.e. Ozone and Ultraviolet

M/O: The biological component. The microorganisms that are specifically found in drinking water. This section may be part of required sampling, i.e. Total Coliform Rule or other biological related sampling. O&M or laboratory training requirement for many operators.

O&M: This area is for normal operation and/or maintenance of the plant. Part of O&M training requirement for many operators.

SAFETY: This area is describing process safety procedures. O&M training requirement for many operators.

TECHNICAL (TECH): The mechanical or physical treatment process/component. The conventional or microfiltration process including pretreatment processes/ applications/ engineering/ theories. Part of O&M training for many operators.

WQ: Having to do with water quality or pollutants, i.e., hard water to primary water standards. May be a requirement of the SDWA and/or water chemistry concerns. This along with the EPA information is to satisfy the regulatory portion of your operator training.

This course contains EPA's federal rule requirements. Please be aware that each state implements drinking water regulations that may be more stringent than EPA's regulations. Check with your state environmental agency for more information.

Task Analysis and Training Needs Assessment Process Information Gathering
Task Analysis and Training Needs Assessments have been conducted to determine or set Needs-To-Know for the basis of this continuing education course. TLC has primary used Training Provider Manual for the Pennsylvania Water and Wastewater System Operator Training Program for course goal setting and learning objectives for all three training formats; conventional classroom, distance paper based and web based training.

Specific Course Goals and Timed Outcomes (Beta Testing)
Initial Alpha Testing 2005. Water Treatment Original Master Course
Twenty students were given a task assignment survey in which to track their times on the above learning objectives (course content-section focus) and utilized a multiple-choice style answer sheet to complete their final assignment. All students were given 30 days to complete this assignment and survey. The original assignment or assessment was in module format so that the completion times and grades could be properly assessed. Thirty students were selected for this assignment. Twenty-one of the students held water distribution or water treatment operator certification positions, and seven students were wastewater treatment operators for a total of twenty-eight operators. Twenty students were successfully tested. Six students failed the final examination. All but four of the students completed the reading assignment. All of the wastewater treatment operators passed the assignment as well as the two non-operators. The average times were based upon the outcomes of the twenty students who passed. Rusty Randall, Proctor, February 2005

Second Beta Testing and Course Adjustment
In the subsequent time, one hundred water/wastewater operator students were selected to complete the assignment and the completion statistics are as follows: 67 percent passing rate with an overall average score of 84 percent within a 90-day assignment completion period. The primary student response was the assignment was too difficult and too long when compared to other CEU course work.

The tasks were measured using times spent on each specific objective goal and final assignment grading of 70% and higher. The student survey was utilized to work out all problems in the assignment and was utilized for course corrections. Rusty Randall, Proctor, July 2012

Final Conclusion
The average time for the Water Treatment 303 is 25.1 hours with an average score of 79 percent.

Accreditation Formula for Figuring CEU Credit**
The results of beta testing were used in conjunction with a formula to determine average student time for accreditation purposes for intended audiences. This formula may not work for unintended audiences.
1 page of text = 2 minutes of student time.
1 word practice problem = 1 minute of student time.
1 word quiz/exam question = 1 minute of student time.

**CEU was awarded based on guidelines established by the International Association of Continuing Education and Training (IACET).

Course Page Count Total
1 page of text = 2 minutes of student time.
1 exam question = 1 minute of student time

540 pages times 2 equals 1080 divided by 60 minutes =18.00 hours
400 questions equals 6.60 hours
Total time 24.60 hours ***We are asking for 24 hours of credit.***

Beta Assessment Survey Results
1. The difficulty of your course.
   Very Easy 0 1 2 3 4 5 Very Difficult

2. Please rate the difficulty of the testing process.
   Very Easy 0 1 2 3 4 5 Very Difficult

3. Please rate the subject matter on the exam to your actual field or work.
   Very Similar 0 1 2 3 4 5 Very Different

Task Analysis and Training Needs Assessment Process Information Gathering
Task Analysis and Training Needs Assessments have been conducted to determine or set Needs-To-Know for the basis of TLC's continuing education courses. The following is a listing of some of those who have conducted extensive valid studies from which TLC has based the continuing education program upon: the Environmental Protection Agency (EPA), the Arizona Department of Environmental Quality (ADEQ), the Texas Commission of Environmental Quality (TCEQ), Pennsylvania Depart of Environmental Protection (PDEP) and the Association of Boards of Certification (ABC).

TLC has primary used Training Provider Manual for the Pennsylvania Water and Wastewater System Operator Training Program for course goal setting and learning objectives for all three training formats; conventional classroom, distance paper based and web based training.

The titles or names of subjects (Learning Objectives) may be changed for readability purposes. Some of the terms used in this document may be part of a copyrighted adult learning assessment process and in these cases, we utilize generic terminology. The needs assessment/survey maintains our training and education materials criteria. Assessments and changes are performed based on changes in technology, evaluations of the students, regulatory changes and editorial corrections. Most of this information is considered **intellectual property** and may not be owned by TLC but by third –parties. All of TLC's information is proprietary.

Assessment Implications
Core tasks have been statistically analyzed then reviewed and edited by the Advisory Committee, SME Experts. These tasks now form a distinct definition of the course and assessment content. The emphasis for most of the levels of operation would be found in the duty/functions discussion below. To recap, bodies of knowledge and concepts that support the understanding and valid performance of the following duty/functions should be taught first. Based on the job-task survey data and beta-testing, the most useful parts of the course are beneficial for the following:

ADDIE
TLC utilizes a five-phase instructional design model consisting of Analysis, Design, Development, Implementation, and Evaluation for our continuing education courses. Each course design step has an outcome that feeds into the next step in the sequence. The five phases of ADDIE are as follows:

ANALYSIS
During the Training Needs Assessment Process Information Gathering Analysis phase, the course designer(s)(see Subject Matter Experts and Contributing Editors) identifies the learning need, the goals and objectives, the student's needs, existing knowledge, Course Statement of Need**,** and any other relevant characteristics (State or Federal Need-to-Know) and to ensure that students are learning what is relevant for their job**.**

DESIGN
This is the systematic process of specifying learning objectives from the Training Needs with a focus on Bloom's Taxonomy. A detailed storyboard following the Needs Assessment/Survey and/or Course Statement of Need will determine the course content.

DEVELOPMENT
The actual creation (production) of the training content will begin based upon the Design phase using Bloom's Taxonomy. At this time, a decision is make to proceed or table the course.

IMPLEMENTATION
During implementation, the Alpha testing plan is put into action and a procedure for course and/or assessment revision is implemented. These course materials and assessments are delivered or distributed to the student group. After delivery, the effectiveness of the training materials is evaluated in Beta testing phase. All of our courses have extensive Alpha and Beta testing to ensure job relevancy, correct information and course learning objectives are met.

EVALUATION
This phase consists of (1) formative and (2) summative evaluation from Alpha and Beta testing. Formative evaluation is present in each stage of the ADDIE process. Summative evaluation consists of tests designed for criterion-related referenced items and providing opportunities for feedback from the students and proctor. Administrative and instructional staff will collect all student concerns (verbal, written and surveys) and distribute these to TLC Administrative personnel for evaluation and course corrections. Course and/or Assessment revisions are made as necessary.

Precept-Based (Micro-Learning) Training Course
TLC's training courses are based upon a form of induction training, made of topical and technical precepts that are discovered in the Needs Assessment/Survey and/or Training Needs Assessment Process Information Gathering. The training topics or learning objectives are made up of "micro-content" or "precepts"– or small chunks of information that can be easily digested. These bite-size pieces of technical information are considered to be one of the most effective ways of teaching students new or important information (regulatory or technical) because it helps the mind retain knowledge easier.

Micro-learning or precept-based training doesn't rely on the student to process a large amount of information before breaking it down. Our method includes short modules with clearly defined learning goals for each section. This method allows a student to hone in on a particular skill, then given the opportunity to exhibit their knowledge in the final assessment (assignment).

Course Training/Assessment Needs Methodology
Technical Learning College identified training/assessment needs by placing identifying them in two categories; internal and external.

Internal Methods include:
- ✓ Observation
- ✓ Interviews
- ✓ Instruments: Perception instruments and Knowledge based assessments
- ✓ Student records and reports
- ✓ Group problem analysis (Classroom or Seminars)
- ✓ Performance or Survey appraisals

External Methods include:
- ✓ Outside consultants (Completion)
- ✓ Government Certification Reviews (Training Needs)
- ✓ Records and reports from other agencies

The needs assessment/survey maintains our training and education materials criteria. Assessments and course material changes are performed based on changes in technology, evaluations of the participants and regulatory changes. Materials are assessed yearly or as needed to insure course integrity.

Course Author
Melissa Durbin
This course was co-authored by Melissa Durbin; she has over 25 years of wastewater treatment teaching experience as a college instructor. Melissa has written the several nationally accepted wastewater treatment manuals since 2001. This course has been accepted in most States for continuing education credit. Melissa has taught approximately 10,000 students about water/wastewater treatment, disinfection and related classes. She will be available to answer questions relating this course.

Extensive Academic Research
Technical Learning College's (TLC's) continuing education course material development was based upon several factors; field experience working in the water quality field, extensive academic research (teaching in the community college system), advice from subject matter experts(State officials and industry leaders), data analysis, task analysis and training needs assessment process information gathered from other states.

Both Melissa and Jeff Durbin are the two primary Instructors, Subject Mater Experts and Technical Writers have trained and/or certified more than ten thousand students. These two Instructors teach on a daily basis in a classroom setting throughout Arizona and on-line to students nationwide. See below for more information.

Advice from Subject Matter Experts
Both Melissa and Jeff Durbin are professional trainers and have been educated in current trends in professional education and continuing education needs.

Primary Course Designers Melissa and Jeff Durbin
Melissa Durbin
This course was co-designed by Melissa Durbin; she has over 25 years of teaching water and wastewater treatment experience as a college instructor. Melissa has written the several nationally accepted water and wastewater treatment manuals. Melissa has taught approximately 10,000 students about water and wastewater treatment and related classes. She will be available to answer questions relating this course.

Jeff Durbin
This course was co-designed by Jeff Durbin, over 10 years of water and wastewater treatment experience as a backflow inspector for the City of Phoenix and 20 years of water and wastewater treatment experience. Jeff has taught approximately 10,000 students about water and wastewater treatment primarily in water distribution, and pollution control (water quality) related classes. Jeff will also be able to answer any question pertaining to this course.

Course Complier
Peter Easterberg, Detail-oriented technical writer/technical editor/desktop publisher/copy editor. 20 years' experience editing and writing feasibility and trade-off studies, test procedures, specifications, user manuals, company policies, HR forms, and ISO-9000 documents. Exceptional grammatical/written communication skills. "Go-to" person for Microsoft Word, Outlook, and general computer questions. Internet Webmaster Certificate (including HTML)

Contributing Editors

James L. Six Received a Bachelor of Science Degree in Civil Engineering from the University of Akron in June of 1976, Registered Professional Engineer in the State of Ohio, Number 45031 (Retired), Class IV Water Supply Operator issued by Ohio EPA, Number WS4-1012914-08, Class II Wastewater Collection System Operator issued by Ohio EPA, Number WC2-1012914-94

Joseph Camerata has a BS in Management with honors (magna cum laude). He retired as a Chemist in 2006 having worked in the field of chemical, environmental, and industrial hygiene sampling and analysis for 40 years. He has been a professional presenter at an EPA analytical conference at the Biosphere in Arizona and a presenter at an AWWA conference in Mesa, Arizona. He also taught safety classes at the Honeywell and City of Phoenix, and is a motivational/inspirational speaker nationally and internationally.

James Bevan, Water Quality Inspector S.M.E. Twenty years of experience in the environmental field dealing with all aspects of water regulations on the federal, state, and local levels. Experience in the water/wastewater industry includes operation of a wastewater facility, industrial pretreatment program compliance sampling, cross-connection control program management, storm water management, industrial and commercial facility inspections, writing inspection reports for industry, and technical reports per EPA permit requirements. Teacher and Proctor in Charge for Backflow Certification Testing at the ASETT Center in Tucson for the past 15 years and I possess an Arizona Community College, Special Teaching Certificate in Environmental Studies. Extensive knowledge and experience in college course and assignment/assessment writing.

Dr. Pete Greer S.M.E., Retired biology instructor, chemistry and biological review.

Jack White, Environmental, Health, Safety expert, City of Phoenix. Art Credits

Ongoing Course Evaluation

Administrative and instructional staff will collect all student concerns (verbal, written and surveys) and distribute these to the Course Editor or Copyeditors for evaluation and course corrections. Administrative and instructional staff will collect all student concerns (verbal, written and surveys) and distribute these to TLC Administrative personnel for evaluation and course corrections. Course and/or Assessment revisions are made as necessary.

Editor's Discretion

The Course Editor may change the course assessment (assignment), course text, objective, artwork and topical order as necessary for security, corrective, printing, readability or typesetting purposes. The assessment may be rotated for security purposes and the course material may be updated to reflect any regulatory updates and/or corrections. The overall course objective or topic guide may be in a different order than the course manual for the reason of typesetting or copy editing purposes. Course materials, charts and artwork amendments, adjustments, modifications may be performed to reflect regulatory/safety text/artwork updates, error adjustments and comprehension. These changes generally do not reflect major course material changes, but are minor in nature.

Course Procedures for Registration and Support

All of Technical Learning College's distance learning courses have complete registration and support services offered. Delivery of services will include e-mail, web site, telephone, fax and mail support. TLC will attempt immediate and prompt service.

When a student registers for a correspondence course/online course, he/she is assigned a start date and an end date. It is the student's responsibility to note dates for assignments and keep up with the course work. If a student falls behind, he/she must contact TLC and request an end date extension in order to complete the course. It is the prerogative of TLC to decide whether to grant the request. All students will be tracked by a unique computer generated number assigned to the student. Some students will be tracked and reported by their operator ID for required state agencies.

Instructions for Written Assignments

The Water Treatment 303 training CEU course uses multiple choice and true/false questions. Answers may be written in this manual or typed out on a separate answer sheet. TLC prefers that students type out and e-mail their answer sheets to info@tlch2o.com, but they may be faxed to (928) 468-0675.

Prerequisites: None

Student Identity, Attendance, and Participation Verification

A proctoring report and/or computer-tracking program validates proper identity, attendance and participation. The student shall submit a driver's license for signature verification and track their time worked on the assignment. The student shall also sign an affidavit verifying they have not cheated and worked alone on the assignment. We follow up with telephone confirmation and/or quiz review assessment. All student attendance is tracked on TLC's student attendance database.

Teaching Techniques and Assessment Tools

Our training courses are based upon a form of induction training, made of topical and technical precepts. The training topics are made up of "micro-content" or "precepts"– or small chunks of information that can be easily digested. These bite-size pieces of technical information are considered to be one of the most effective ways of teaching people new information because it helps the mind retain knowledge easier. Micro-learning or precept-based training doesn't rely on the student to process a large amount of information before breaking it down. Our method includes short modules with clearly defined learning goals for each section with a post quiz and a final assessment (quiz). This method of pre-quiz allows a student to hone in on a particular skill, then given the opportunity to exhibit their knowledge in the final assessment.

TLC Contact Information

All instructors and administrative staff are obligated to respond within 1 day by email, snail mail or telephone providing proper guidance to successfully complete the assignment. Email and telephone inquiries are handled quickly, generally within 2 hours of the call.

We encourage students to complete their work with less frustration and fewer delays by calling or e-mailing us for any concern. We attempt to provide direct interaction similar to conventional classroom training.

Security and Integrity
All students are required to do their own work. All lesson sheets and final exams are not returned to the student to discourage sharing of answers. Any fraud or deceit and the student will forfeit all fees and the appropriate agency will be notified. A random test generator will be implemented to protect the integrity of the assignment.

TLC's Educational Learning Objective Topics
The general course descriptions or topic titles may be different from the detailed description of the course's outline or learning objectives. These terms may be an alternative expression or a substitute but essentially having the same meaning. This is done for reading or for editing purposes. The detailed alpha and beta-testing data is not available in this document and is proprietary information belonging to a third party. The CEU course covers several educational topics/functions/purposes/objectives of compliance. The general course description of topics may be different from the detailed description. These differences are cosmetic only. The topics listed are to assist in determining which educational objective or goal that is covered for a specific educational topic area. The general information is available in the detailed beta-testing information and may be found in the course's table of contents. The detailed testing information is not available in this document and is proprietary information.

Student Information Personal Data Security Procedures
All information regarding the student is strict and privileged only. This information is held in secure databases and is not sold or provided to any one unless the student requests a copy or a State agency does an audit. Even during audits, we restrict confidential information unless the Agency can provide a legitimate excuse. Some of this security information and data is priority and details are not provided. Students are not provided with any passwords at this time.

Certificate of Completion
TLC will offer the student either pass/fail or a standard letter grading assignment. If TLC is not notified, the student will only receive a pass/fail notice. In order to pass your final assignment, you are required to obtain a minimum score of 70% on your assignment.

The certificate of completion will have all text in capital letters and there is a water mark of the Technical Learning College in three colors along with anti-counterfeiting security measures on the edge of the certificate. An electronic copy is assigned to the student's electronic record with issue date.

Disclaimer and Security Notice
The student shall understand that it their responsibility to ensure that this CEU course is either approved or accepted in my State for CEU credit. The student shall understand and follow State laws and rules concerning distance learning courses and understand these rules change on a frequent basis and will not hold Technical Learning College responsible for any changes. The student shall understand that this type of study program deals with dangerous conditions and will not hold Technical Learning College, Technical Learning Consultants, Inc. (TLC) liable for any errors or omissions or advice contained in this CEU education training course or for any violation or injury caused by this CEU education training course material.

Student Assistance
The student shall contact TLC if they need help or assistance and double-check to ensure the registration page and assignment has been received and graded.

Final Examination for Credit
Opportunity to pass the final comprehensive examination is limited to three attempts per course enrollment.

Required Texts
This course comes complete and does not require any other materials.

Environmental Terms, Abbreviations, and Acronyms
TLC provides a glossary in the rear of this manual that defines, in non-technical language, commonly used environmental terms appearing in publications and materials, as well as abbreviations and acronyms used throughout the EPA and other governmental agencies.

ADA Compliance
TLC will make reasonable accommodations for persons with documented disabilities. Students should notify TLC and their instructors of any special needs. Course content may vary from this outline to meet the needs of these particular students.

Feedback Mechanism (Examination Procedures)
Each student will receive a feedback or survey form as part of his or her study packet. The student will be able to find this form in the front of the assignment or lesson(assessment). The student can e-mail, snail mail or telephone TLC for any concern at any time.

Student Concerns
Most of student/training course related concerns are generally answered within 2 hours but not more than 24 hours. TLC has three support staff administrators with computers and telephones and have excellent communication and computer skills and able to respond and track all students and obtain or submit required forms and assignments. TLC has a dedicated computer student tracking system database that is backed-up on a daily bases and this information is secured and stored at a secure offsite location in case of fire or security problems. All student website information is tracked and documented for security measures.

Recordkeeping and Reporting Practices
TLC keeps all student records for a minimum of five years. It is the student's responsibility to give the completion certificate and/or paperwork to the appropriate government agencies. If necessary, we will electronically submit the required information to any other required state agencies for your certification renewals.

TLC Record Storage
TLC's training records include the following elements:
1. Individual course training (assessment) and registration page (Customer Order Record) is recorded in Excel format and the hard copies are scanned and stored in a computer database for 5 years and include the following:
a. the instructor(s) who taught each session on that date the of the training session or grading was offered (in comments section registration page) as well as which instructor was considered to be the lead instructor(s) and by the Director.
b. the name of the instructor(s) and facilitator(s) who proctored and/or graded the examination for each training session if applicable (in comments section registration page);
c. the attendance sign-in sheet(s) (registration page) for each training course or session;
d. all graded and dated validated examination answer (Assessment) sheets for each examination attempt including an explanation (written in comments and/or Excel list) for any

retests as well as a narrative explaining any assistance provided to the attendee before the re-test; and
e. session evaluation(survey)forms (in comments section registration page and or Excel list).

Grading Criteria
TLC offers students the option of either pass/fail or assignment of a standard letter grade. If a standard letter grade is not requested, a pass/fail notice will be issued. Final course grades are based on the total number of possible points. The grading scale is administered equally to all students in the course. Do not expect to receive a grade higher than that merited by your total points. No point adjustments will be made for class participation or other subjective factors. For security purposes, please fax or e-mail a copy of your driver's license and always call us to confirm we've received your assignment and to confirm your identity.

Final Assignment
The final examination assignment is determined by the examination administrator or the instruction and there are generally three versions that are readily available. There are also three levels of the examination from average, (5 Answers) Difficult (5 +All of the above) and very difficult (Six answers and All of the above). The student is provided the average rated examination unless there is a condition or concern that requires a more difficult exanimation. Example, two or more students at the same address or any suspicion of cheating or potential fraud. We try to ensure the security and learning experience. Assignments/answer keys are only accessible to instructors and administrative staff that have a need to know clearance.

Failure
If the student fails the examination, they are provided with two more chances to successfully pass the exam with a score of 70% or better. The student may receive a different and randomly generated exam. Upon failure of an exam, the student can submit their concerns in writing or submit a survey form and has the option to receive instructor assistance that would be equivalent to conventional classroom assistance in discovering the areas that are deficient. The instructor has the option in describing the assistance method or procedure depending upon the student's deficiencies.

Grading Criteria
TLC will offer the student either pass/fail or a standard letter grading assignment.
A 900 – 1000 points
B 800 – 899 points
C 700 – 799 points
D 600 – 699 points
F <600 points

In order to successfully pass this course, you will need to have 70% on the final exam. The entire assignment is available on TLC's Website in a Word document format for your convenience.

Forfeiture of Certificate (Cheating)
If a student is found to have cheated on an examination, the penalty may include--but is not limited to--expulsion; foreclosure from future classes for a specified period; forfeiture of certificate for course/courses enrolled in at TLC; or all of the above in accordance with TLC's Student Manual. A letter notifying the student's sponsoring organization (State Agency) of the individual's misconduct will be sent by the appropriate official at TLC. No refund will be given for paid courses. An investigation of all other students that have taken the same assignment

within 60-day period of the discovery will be re-examined for fraud or cheating. TLC reserves the right to revoke any published certificates and/or grades if cheating has been discovered for any reason and at any time. Students shall sign affidavit agreeing with all security measures. The student shall submit a driver's license for signature verification and track their time worked on the assignment. The student shall sign an affidavit verifying they have not cheated and worked alone on the assignment.

Note to students: Keep a copy of everything that you submit.
If your work is lost, you can submit your copy for grading. If you do not receive your certificate of completion or quiz results within two or three weeks after submitting it, please contact us immediately. We expect every student to produce his/her original and independent work.

Any student whose work indicates a violation of the Academic Misconduct Policy (cheating, plagiarism) can expect penalties as specified in the Student Handbook, which is available through Student Services; contact them at (928) 468-0665. A student who registers for a distance learning course is assigned a "start date" and an "end date." It is the student's responsibility to note due dates for assignments and to keep up with the course work. If a student falls behind, she/he must contact the instructor and request an extension of her/his *end date* in order to complete the course. It is the prerogative of the instructor to decide whether or not to grant the request.

Your assignments are due on time. Any assignment or mailed-in examination that is one to five days late will be marked down one letter grade. Any assignment or mailed-in examination that is turned in *later* than five days will not be accepted and will be recorded in my grade book as "non-participating" and you can be withdrawn from class. (See final grade options.)

Proctoring Instructions
Students enrolled in Technical Learning College's CEU courses that require proctored testing and **who do not live in the physical service area** of the Technical Learning College Test Center must nominate and gain prior approval of a proctor who will monitor course tests. A new proctor nomination form is required for each term and for each class.

PROCTORS, *If Necessary…*
A proctor is an individual who agrees to receive and administer a student's test(s) from Technical Learning College at the proctor's business email address. The test(s) will be ethically and professionally administered in a suitable testing environment (e.g., college/library or professional office). The proctor will return the test(s) to the Technical Learning College Test Center via fax immediately after administration, and the proctor will mail the exam within one (1) work day of administration to the Technical Learning College Test Center.

Proctors certify in writing to the Technical Learning College Test Center that the student completed the test according to all of the specific directions provided in the proctor guidelines letter. As the Proctor Nomination Form indicates, the student will identify the specific test(s) the proctor will monitor.

Any proctor the student nominates must be acting in the official capacity in one of the following positions:

- **College or University Personnel:** Dean, Department Chair, Student Records, Professional Staff Member of an adult/continuing education office or counseling center, Librarian, Professor, or any official testing center personnel if the tests are administered in the center.

- **Armed Forces Education Office Personnel**
- **Public or Private School Personnel:** Superintendent, Principal, Guidance Counselor, or Librarian.
- **Other:** Civil Service Examiner, Librarian for City/County, HR Professional, or Education/Training Coordinator.

The following persons do not qualify as proctors:

- Co-workers, someone who reports to you or your immediate supervisor
- Friends
- Neighbors
- Relatives

Nominating a Proctor

Students are responsible for identifying, nominating, and making all of the arrangements for the proctoring of their course tests, including the payment of any fees for services and the return of test materials to Technical Learning College Test Center (cost of FAX or postage). The proctor must be able to receive the student's test(s) via email as attachments. The Technical Learning College Test Center does not accept Yahoo, AOL, G-mail, Hotmail, or etc. email addresses.

If the student is unable to find a suitable proctor, they must contact the Technical Learning College Test Center for assistance immediately via email.

Proctor Nomination Form

Students will use the Proctor Nomination Form for nomination and approval of a proctor. The student will complete the top part of the form for each course s/he is taking, even if the same proctor is used for all tests. The student must click on the submit button for the data to be electronically transmitted to the Technical Learning College Test Center.

Disclaimer Notice

It is ultimately the student's responsibility to ensure that this CEU course is either approved or accepted in my State for CEU credit. The student shall understand State laws and rules change on a frequent basis and believe this course is currently accepted in their State for CEU or contact hour credit, if it is not, the student shall will not hold Technical Learning College responsible. The student shall also understand that this type of study program deals with dangerous conditions and that the student shall will not hold Technical Learning College, Technical Learning Consultants, Inc. (TLC) liable for any errors or omissions or advice contained in this CEU education training course or for any violation or injury caused by this CEU education training course material. The student shall will call or contact TLC if help or assistance is needed and double-check to ensure the registration page and assignment has been received and graded.

Affidavit of Exam Completion

The student shall affirm that they alone completed the entire text of the course. The student shall affirm that they completed the exam without assistance from any outside source. The student shall understand that it is their sole responsibility to file or maintain their certificate of completion as required by the state.

Refund Policy

We will beat any other training competitor's price for the same CEU material or classroom training. Student satisfaction is guaranteed. We will refund course fees if the course is not accepted for credit by the State. Otherwise, any other problem will be given an exchange credit towards an acceptable or approved course for the State. Once we are notified of the refund or

exchange, we will generally issue a refund in 30 days of the problem and exchange within the same day.

Continuing Education Units
You will have 90 days from receipt of this manual to complete it in order to receive your Continuing Education Units (**CEUs**) or Professional Development Hours (**PDHs**). A score of 70% or better is necessary to pass this course. If you should need any assistance, please visit our Assistance Page on the website. Please e-mail all concerns and the final test to info@tlch2o.com.

Mission Statement
Our only product is educational service. Our goal is to provide you with the best possible education service possible. TLC will attempt to make your learning experience an enjoyable opportunity.

Note to Students
Keep a copy of everything that you submit! If your work is lost, you can submit your copy for grading. If you do not receive your certificate of completion or other results within two to three weeks after submitting it, please contact your instructor.

When the Student finishes this course…
At the conclusion of this course:
At the finish of this course, you (the student) should be able to explain and describe the water treatment process dealing with surface drinking water from raw water source to finished water in the distribution system. You will understand the water treatment processes (mechanical and Chemical) and principles behind the process, current and emerging process configurations, alternative disinfectants, cross-connections, hydraulic and flow issues, sampling methods, microbiological identification, water distribution issues and drinking water regulations.

Upon successful completion of this course, the student will obtain 24 hours of continuing education relating to convention water treatment techniques.

Educational Mission
The Educational Mission of TLC is:
To provide TLC students with comprehensive and ongoing training in the theory and skills needed for the environmental education field,

To provide TLC students with opportunities to apply and understand the theory and skills needed for operator certification,

To provide opportunities for TLC students to learn and practice environmental educational skills with members of the community for the purpose of sharing diverse perspectives and experience,

To provide a forum in which students can exchange experiences and ideas related to environmental education,

To provide a forum for the collection and dissemination of current information related to environmental education, and to maintain an environment that nurtures academic and personal growth.

Student is required to submit the following information for assignment grading…

1. 70 PERCENT ON FINAL ASSESSMENT
2. DRIVER'S LICENSE
3. SCHEDULE OF TIME WORKED ON ASSIGNMENT
4. AFFIDAVIT OF EXAM COMPLETION
5. PROCTOR CERTIFICATION
6. TELEPHONE CONFIRMATION

CUSTOMER SERVICE RESPONSE CARD

NAME: _____

E-MAIL_____PHONE_____

PLEASE COMPLETE THIS FORM BY CIRCLING THE NUMBER OF THE APPROPRIATE ANSWER IN THE AREA BELOW.

1. Please rate the difficulty of your course.
   Very Easy 0 1 2 3 4 5 Very Difficult

2. Please rate the difficulty of the testing process.
   Very Easy 0 1 2 3 4 5 Very Difficult

3. Please rate the subject matter on the exam to your actual field or work.
   Very Similar 0 1 2 3 4 5 Very Different

4. How did you hear about this Course? _____

5. What would you do to improve the Course?

_____

_____

How about the price of the course?

Poor_____ Fair ____ Average ____ Good____ Great_____

How was your customer service?

Poor___ Fair ____ Average ____ Good _____ Great_____

Any other concerns or comments.

_____

_____