

CUYAMACA COLLEGE
COURSE OUTLINE OF RECORD

CENTER FOR WATER STUDIES 284 – CROSS-CONNECTION CONTROL SPECIALIST–RECYCLED WATER

3 hours lecture, 3 units

Catalog Description

Study of the administrative and technical procedures concerning the production, use and distribution of recycled water including backflow protection, legal, administrative and permitting issues, the treatment process, health and safety aspects, and the cross-connection control (shut down) test as conducted in San Diego County. Various aspects of cross-connection control recycled water shut down testing will be demonstrated.

Prerequisite

None

Course Content

- 1) Introduction to Reclaimed Water Issues
 - a. Why the need for recycled water
 - b. History of recycled water
 - c. Where it is used now, both in U.S. and worldwide
 - d. Philosophical perspective: the health agency point of view, the purveyor point of view, the public point of view and why the differences
- 2) Review of Backflow Issues
 - a. Backflow devices
 1. Domestic water systems
 2. Recycled water systems
 3. Fire sprinkler systems
 - b. Degree of hazard
 - c. Legal aspects
 - d. Actual incidents
 - e. Surveys
 - f. System separation
 - g. Pipe marking methods
 - h. Gray water
- 3) Legal Aspects of Recycled Water
 - a. Federal Clean Water Act and Safe Drinking Water Act
 - b. State of California Title 22 and Title 17
 - c. Porter Cologne Act
 - d. Plumbing codes
 1. California Plumbing Code, Appendix J
 2. California Plumbing Code, Chapter 6
 - e. Specific California laws relating to recycled water
 - f. What is "law" and what is "policy"?
- 4) Who Are The Players and What Are Their Responsibilities
 - a. Federal government
 - b. State government
 - c. Regional water quality control boards
 - d. State health department
 - e. Local health departments

- f. Water purveyors
 - g. Recycled water producers and wholesalers
 - h. Local political jurisdictions
 - i. The user site supervisor
 - j. Public
- 5) The Treatment Process
- a. Sewage and source control: industrial sources, biotech
 - b. Primary treatment
 - c. Secondary treatment
 - d. Tertiary treatment
 - e. Advanced treatment methods
 - f. Alternate treatment methods
 - g. Re-purified recycled water/indirect potable reuse
- 6) The Treatment Process and Health Aspects
- a. Review of microbiological constituents
 - b. Review of organic and inorganic constituents
 - c. Review of synthetic organic compounds and endocrine disruptors
 - d. Scientific basis of 2.2 disinfected tertiary, 23 secondary, etc., how these numbers were determined and their validity
 - e. 5-log virus removal and what it means
- 7) Permitting and Requirements for Recycled Water Usage
- a. Distribution System
 - 1. Types of permits: master permits, site specific permits
 - 2. Dual plumbed systems and dual sourced systems
 - 3. Purveyors rules and regulations
 - 4. Main distribution system
 - 5. Site distribution systems: new sites, retrofit sites
 - 6. Distribution storage: open reservoirs, closed reservoirs
 - 7. Development of distribution and use site plans
 - 8. Plan check for new use sites
 - 9. Plan check for retrofit use sites
 - 10. Responsibility for installation inspections
 - 11. Operation of system: failures, backup systems
 - b. Use site considerations for recycled water use
 - 1. Proper use of recycled water
 - 2. Economic considerations
 - 3. Public health considerations
 - 4. Commercial buildings
- 8) Recycled Water Approved Uses
- a. Irrigation
 - b. Indoor uses
 - 1. Toilets
 - 2. Urinals
 - 3. Trap primers
 - c. Industrial uses
 - 1. Cooling towers
 - 2. Process waters
 - 3. Laundries
 - d. Fire protection systems
 - e. Recreational uses (full body contact; not necessarily so)
 - 1. Boating and fishing
 - 2. Waterskiing
 - 3. Swimming
 - f. Agricultural uses

- g. Other approved uses
- 9) Cross-Connection Control (Shut Down Test)
 - a. Preliminary arrangements and pre-inspection preparation
 - 1. AWWA dual water system policy
 - 2. AWWA retrofit guidelines
 - 3. California Plumbing Code, Appendix J
 - 4. State of California Title 22 and Water Code requirements
 - 5. Local requirements: DEH Recycled Water Plan Check and Inspection Manual, current edition, local codes and permitting
 - 6. MOU between local and state health
 - b. Physical field test methods
 - 1. Drip method
 - 2. Pressure recorder method (analog and digital)
 - 3. Dye test (video)
 - 4. Various site specific test modifications
 - c. Engineering report review
 - 1. Comply with all updates and revisions
 - 2. Evaluate type of recycled water received
 - 3. Determine if users meet regulations
 - 4. Engineering report for cooling towers
 - 5. Engineering report for other unique uses
- 10) Cross-Connection Control (Shut Down Test)
 - a. Agency coordination
 - 1. Regional water quality control boards
 - 2. Purveyor: potable and recycled water
 - 3. State health department
 - 4. Local health department
 - 5. Test site manager/site supervisor
 - b. Site survey/inspections and frequency considerations
 - 1. Initial
 - 2. Annual
 - 3. Every fourth year
 - c. Initial site survey
 - 1. Field test backflow prevention assembly(s)
 - 2. Determine internal plumbing system operation and cross-connections
 - 3. Bleed by
 - 4. Threshold valves
 - 5. Signage
 - 6. Recordkeeping
 - d. Test methodology based on the configuration of the use site
 - 1. Park sites
 - 2. Commercial sites
 - 3. Golf courses
 - 4. Schools
 - 5. Residential sites
 - 6. Hospitals
 - 7. Shopping centers and strip malls
 - 8. How to determine the shut down time element
- 11) Cross-Connection Control (Shut Down Test)
 - a. Testing methodology
 - 1. Engineering report compliance and method outline
 - 2. Types of test
 - (1) Equipment
 - (2) Time requirements

3. Problems
 - (1) Site preparation
 - (2) Hostile site manager - communication
 - (3) Emergency turn on - if it all goes wrong
4. Scheduling
5. Cross-connection discovery
 - (1) Repair and replacement
 - (2) Treatment of contaminated domestic system
 - (3) Flushing
 - (4) Notification
 - (5) Public relations
 - (6) Documentation
- b. Post-test inspection
 1. Review test results
 2. Documentation
 3. Collect all pressure graphs, analyze, etc.
- c. Domestic water and recycled water service restoration
 1. Water hammer
 2. Entrapped air
 3. Flushing of customers' internal system
 4. Remain on site until customer is prepared to assume full responsibility
 5. Walk through site with systems in full operation
 - (1) Check function of water system
 - (2) Document walk through
 6. Changes/corrections to site supervisor
- 12) Cross-Connection Control (Shut Down Test)
 - a. How to perform an actual shut down test
 - b. The new reclaimed water use site
 - c. The retrofit reclaimed water site
- 13) Lab Work
 - a. Leaking curb stops, customer valves and backflow assemblies
 - b. Water heaters
 - c. Pressure regulators
 - d. Thermal expansion
 - e. Threshold valves or lack of same and location
 - f. Water use inside building
 - g. Bypasses, high lines and pressure regulators and backflow assemblies
 - h. Combined services
 - i. Air locks
 - j. Systems with no points of connection
 - k. Irrigation system operation
 - l. Restoring service and precautions
 - m. Securing testing devices to avoid tampering
 - n. Hidden or valved connections
 - o. Tool contamination and disinfection
 - p. Notification, notification, notification

Course Objectives

Students will be able to:

- 1) Describe backflow issues as related to recycled water.
- 2) Describe the roles of the water agencies, regulatory agencies, and end users involved in recycled water.
- 3) Compare and contrast recycled water treatment processes from primary to advanced treatment methods.

- 4) Describe the treatment process, health aspects, and the 5-log virus removal requirement.
- 5) Discuss the potential impact of synthetic organic compounds, endocrine disruptors, and other pathogenic organisms.
- 6) List approved uses for recycled water.
- 7) Describe the preliminary shut down test requirements and the engineering reports required for recycled water use.
- 8) Describe agency coordination and field evaluations.
- 9) Describe shut down test methodology.
- 10) Observe and recognize the procedure of a hands-on performance of the shutdown test.
- 11) Discuss how to resolve problems encountered during the shutdown test.

Method of Evaluation

A grading system will be established by the instructor and implemented uniformly. Grades will be based on demonstrated proficiency in subject matter determined by multiple measurements for evaluation, one of which must be essay exams, skills demonstration or, where appropriate, the symbol system.

- 1) Quizzes
- 2) Midterm and final exam (objective, essay)
- 3) Projects and assignments utilizing the Field Operations Skills Yard

Special Materials Required of Student

None

Minimum Instructional Facilities

Smart classroom

Method of Instruction

- 1) Lecture and demonstration
- 2) Group discussion
- 3) Audiovisual
- 4) Field trips
- 5) Demonstrations utilizing the Field Operations Skills Yard

Out-of-Class Assignments

- 1) Reading assignments
- 2) Writing assignments
- 3) Projects

Texts and References

- 1) Required (representative examples):
 - a. Gupta and Ali, *Environmental Water: Advances in Treatment, Remediation and Recycling*. Elsevier, 2012.
 - b. California Health Laws Related to Recycled Water, "The Purple Book" (download from Internet), California Department of Public Health.
 - c. *Recycled Water Plan Check and Inspection Manual*. San Diego County Department of Environmental Health.
- 2) Supplemental: None

Student Learning Outcomes

Upon successful completion of this course, students will be able to:

- 1) Explain the need for recycled water from a current and historical perspective including backflow protection issues.
- 2) Discuss the legal aspects of recycled water and how the various local, state and federal codes interrelate.

- 3) Describe the roles of the water agencies, regulatory agencies, and end users involved in recycled water.
- 4) List the permitting and regulatory requirements for the production and use of recycled water.
- 5) Describe shut down test methodology and discuss how to identify and resolve problems encountered during the shutdown test.