

**Small Wastewater System Operation and Maintenance, Volume 1
B—Collection Systems, Wastewater Treatment, and Maintenance
California State University, Sacramento
(4.3 Continuing Education Units)**

COURSE DESCRIPTION

This course is designed to train operators in the practical aspects of operating and maintaining wastewater system equipment and processes suited to systems that service communities with populations of 10,000 people or fewer and average daily wastewater flows of no more than 1 million gallons per day. This course presents information on gravity, pressure, and vacuum wastewater collection systems; wastewater treatment using sand and gravel filters and lagoon systems; and proper maintenance procedures for equipment and processes used in small wastewater systems.

COURSE OUTLINE

Building on Volume 1, this course trains operators to safely and effectively operate and maintain wastewater system components that are suitable for small wastewater systems.

Chapter 4, Collection Systems

Learning Objectives

1. Identify and describe the components of gravity, pressure, and vacuum collection systems, and describe how those systems work.
2. Use flow and capacity calculations in operating and troubleshooting wastewater collection systems.
3. Explain how to safely operate, maintain, and troubleshoot conventional gravity collection systems, small-diameter gravity sewer systems, pressure collection systems, and vacuum collection systems.
4. Accurately record and evaluate operation, maintenance, and cost information for wastewater collection systems.

The main purposes of this chapter are to describe gravity, pressure, and vacuum collection systems used in small systems and their safe and effective operation and maintenance.

Chapter 5, Wastewater Treatment

Learning Objectives

1. Describe how to safely operate, dose, maintain, and troubleshoot intermittent and recirculating sand filters.
2. Explain how to operate and maintain gravel and other packed bed filters.
3. Describe how to use standard procedures, preventive maintenance, performance indicators (such as laboratory results and loading calculations), startup and shutdown procedures, and recordkeeping to safely and effectively operate lagoon systems.
4. Explain how to develop a lagoon operating strategy based on principles of lagoon operation, the type of lagoon, and the factors influencing and controlling lagoon treatment processes.
5. Discuss how to assess lagoon operation to identify sources of problems or abnormal operations and make operational adjustments to return to normal operation.

The main purpose of this chapter is to train operators in procedures and practices to safely and effectively operate and maintain wastewater treatment processes commonly used in small wastewater systems.

Chapter 6, Maintenance

Learning Objectives

1. Explain different approaches to equipment, process, and facility maintenance and their advantages and disadvantages.
2. List the components of a maintenance program.
3. Discuss maintenance procedures for safely maintaining wastewater collection systems and treatment plants.
4. Understand the terms, nature of, and safety procedures for electricity and electrical equipment.
5. Discuss the types of and maintenance for motor and pump varieties and pneumatic systems.

The main purpose of this chapter is to train operators in the proper procedures to maintain equipment and processes used in decentralized wastewater systems.

TIME ASSIGNMENT

Text pages: The content from the training manual used in this course, *Small Wastewater System Operation and Maintenance*, Volume 1, includes 376 pages. The average word count on a page from the training manual is 525 words. The training manual used for this course contains text, tables, graphs, illustrations, math example problems, section questions, and chapter review questions to enhance the presentation of information and the student learning experience. The course is designed for students to spend the same amount of time reading the tables, graphs, and illustrations as they spend reading the equivalent amount of related chapter text. Therefore, each page is assumed to contain the equivalent of 524 words. The average reading speed is 130 words per minute; therefore, each page is projected to require 4 minutes of student time for each reading.

Math example problems: The course contains 16 math example problems. The projected average time to solve each math problem is 3 minutes.

Section questions: The course contains 211 section questions, located in the “Check Your Understanding” sections integrated throughout the chapter text. These questions enable students to self-assess their understanding of a section’s material before proceeding to the next section. The projected average response time is 2 minutes per question.

Chapter review questions: The course contains 150 review questions, located in the “Chapter Review” at the end of each chapter. Question types include fill-in, multiple choice, and matching. The projected average response time is 2 minutes per question.

Objective test questions: The course contains 150 test questions. There is 1 objective test per chapter. The projected average response time is 2 minutes per question.

Course component	Number of component units		Minutes required to complete component unit		Total time assignment for component
Text pages	376	×	4	=	1,504
Math example problems	16	×	3	=	48
Section questions	211	×	2	=	422
Chapter review questions	150	×	2	=	300
Objective test questions	150	×	2	=	300
					2,574 minutes
					42.9 hours