Operation and Maintenance of Wastewater Collection Systems, Volume 1
Office of Water Programs
California State University, Sacramento
(9.0 Continuing Education Units)

Objective

This course provides training in the safe and effective operation and maintenance of wastewater collection systems.

Scope

This course is designed to train operators in the practical aspects of wastewater collection system operation and maintenance (O&M), with an emphasis on safe practices. The material focuses on the knowledge and skills operators need to identify system problems and select appropriate methods to solve them.

Topics include the responsibilities of the collection system operator, the need for collection system O&M, and the typical components and design of collection systems. Operators learn about safe procedures for:

- Working in traffic with temporary traffic control (TTC) devices
- Setting up and working in excavation sites requiring shoring
- Following confined space entry requirements
- Inspecting and testing new and rehabilitated sewers
- Completing underground repairs and construction

Collection system inspection methods and equipment are discussed in details. Topics include closed-circuit television (CCTV) equipment, clearing stoppages, cleaning sewers, and controlling corrosion and other problems in collection systems. The Check Your Understanding questions throughout the chapter and the chapter review at the end of each chapter gives you the opportunity to self-assess your understanding of the material by answering fill-in, matching, and multiple-choice questions. You also practice solving math problems related to collection system O&M in the appendix that provides a thorough introduction to basic math for operators.

Learning Objectives

Chapter 1, Introduction to Wastewater Collection

1. Explain the type of work done by collection system operators.
2. Describe where to look for jobs in this profession.
3. Outline how to learn or determine procedures necessary to perform the collection system operator's job.
4. Describe the challenges of wastewater collection system operation and maintenance.

5. Justify the need for wastewater collection system operation and maintenance.
6. Outline what wastewater collection system operators are expected to achieve and what skills and knowledge they must possess.

Chapter 2, Wastewater Collection Systems: Purpose, Components, and Design

1. List the parts of a wastewater collection system and explain the purpose of each part.
2. Communicate to design engineers the importance of preventing operation and maintenance problems when designing collection systems.
3. Identify sources and calculate quantities of wastewater flow.
4. Estimate the velocity of water flowing in a sewer.
5. Review plans and specifications for wastewater collection systems from the viewpoint of effective operation and maintenance of collection systems.

Chapter 3, Safe Procedures

1. Demonstrate an awareness of collection system hazards and a commitment to accomplish every task in a safe manner.
2. Inspect safety features of and safely operate vehicles and equipment.
3. Safely perform tasks at various work sites, prevent electrical and fire hazards, and avoid excessive noise hazards.
4. Work safely in streets using temporary traffic control (TTC) zone devices properly while protecting road users and pedestrians from work areas in streets and sidewalks.
5. Identify and reduce confined space hazards by using the appropriate equipment, including atmospheric test/alarm instruments, and procedures when working in or around such areas.
6. Interpret and comply with OSHA's Hazard Communication Standard and worker Right-To-Know laws.

Chapter 4, Inspecting and Testing Collection Systems

1. Inspect and test existing sewers for operation and maintenance problems and new sewers and replacement sewers for installation as planned by examining line and grade, joint and junction adequacy, and proper installation of manholes and appurtenances using inspecting and testing tools and procedures, such as closed-circuit television and smoke and dye testing.
2. Determine the severity of problems such as leaks in joints, taps, sewers, and manholes of existing facilities; illegal, unauthorized, or improper connections; and inflow, infiltration, exfiltration, and diversion flows as well as damage due to corrosion, cracking, crushing, subsidence (soil settling), root intrusion, stoppages, washouts, and improper connections.
3. Provide meaningful reports to supervisors so they can assign priorities to develop cost-effective maintenance or corrective action programs.

Chapter 5, Pipeline Cleaning and Maintenance Methods

1. Identify types and causes of sewer stoppages and select proper methods to clear stoppages and clean sewers.
2. Determine equipment and staffing requirements for various sewer clearing and cleaning methods.
3. Set up, operate, and maintain a variety of sewer clearing and cleaning equipment safely and effectively without flooding homes and basements.
4. Record essential data regarding clearing and cleaning operations.
5. Establish a preventive maintenance program for sewer cleaning equipment.
6. Develop a program to control odors.

Chapter 6, Underground Repair and Construction

1. Safely repair or construct sewer lines and manholes.
2. Contact utility agencies with underground facilities near a construction or repair project before excavation starts.
3. Determine and check pipeline grade.
4. Raise a manhole frame and cover to grade, and repair and install manhole bottoms.
5. Excavate, repair, and backfill service lines and main lines.
6. Inspect a sewer under construction for proper bedding materials and construction, pipe laying procedures, and backfilling and compaction.
7. Test the ability of a wastewater collection system to withstand inflow/infiltration.

Other Sections

- Appendix A, Introduction to Basic Math for Operators
- Answer Key
- Glossary
- Index

Time Assignment

This course time assignment outlines the components of a distance learning (correspondence) training course offered by OWP for continuing education units (CEUs) or contact hours.

Title of course and training manual: Operation and Maintenance of Wastewater Collection Systems, Volume 1, Eighth Edition
Number of text pages: 616

Average word count: 497 words per page
Average reading speed: 130 words per minute; 4 minutes per page
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.

Number of math example problems: The course contains 89 math example problems. The math examples support and expand the concepts presented in the chapter text.
Average math example problem solution speed: 3 minutes per example problem

Number of section questions: The course contains 377 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 of material before proceeding to the next section.
Average section question/answer speed: 2 minutes per question

Number of chapter review questions: The course contains 240 review questions, located in the "Chapter Review" at the end of each chapter. Question types include fill-in, multiple choice, and matching.
Average chapter review question/answer speed: 2 minutes per question

Objective test questions: The course contains 270 test questions. There is one objective test per chapter. Question types include true/false; best answer (one correct answer); multiple choice (one or more correct answers); and math (requiring students to work through equations to find solutions).
Average objective test question/answer speed: 2 minutes per question

The table summarizes the course components outlined above and shows the calculations for the total time assignment values in minutes and hours.

Course component	Number of component units		Minutes required to complete component unit		Total time assignment for component
Text pages	616	×	4	=	2,464
Math example problems	89	×	3	=	267
Section questions	377	×	2	=	754
Chapter review questions	240	×	2	=	480
Objective test questions	270	×	2	=	540
					4,505 minutes
					75 hours