

Course Title: Math Applications in Collection Systems

Course Hours: 18 (1.8 CEUs)

Course Description:

This course focuses on math concepts related to collection systems operation and maintenance and applies these concepts to work-related math problems. Operators practice solving math problems while getting step-by-step instructions. This course covers topics that operators encounter on the job with the goal of helping them confidently perform their jobs better. It does not attempt to cover the topics of any state certification exam.

Course Objectives:

Upon completion of this course, participants will be able to perform math calculations typically used in collection systems. Course objectives include:

- Become familiar with and gain practice performing math calculations typically used in collection systems
- Calculate a design flow for a community based on the size of the community, the industry, and the commercial sector
- Understand how infiltration/inflow affect design flow estimation
- Calculate flow rates based on population equivalent
- Solve math problems related to flow rate and velocity
- Estimate velocity and flow rate in pipes using the Manning Equation
- Perform calculations related to CCTV inspections, pressure testing of pipes, and field inspection and testing

Course Outline:

- 1) Basic Math Concepts (250 minutes)
 - a. Numbers and Operations
 - b. Order of Operations
 - c. Basic Algebra
 - d. Percentages
- 2) Intermediate Math Concepts (290 minutes)
 - a. Units
 - b. Area
 - c. Volume
 - d. Mass and Weight
 - e. Density and Specific Weight
 - f. Concentration
 - g. Velocity and Flow Rate
 - h. Force and Pressure
 - i. Work, Head, and Power
 - j. Metric System
- 3) Advanced Math Concepts (320 minutes)
 - a. Pumps
 - b. Evaluating Pump Performance
 - c. Analyzing and Presenting Data
 - d. Describing Data or Results

- e. Moving Averages
- f. More Applications of Graphing and Charting
- g. Regression Analysis (Prediction Equations, Trends, and Correlations)
- 4) Overview of Math Applications in Collection Systems (10 minutes)
 - a. Introduction
 - b. Watch 2 course videos
- 5) Design Flow Calculations (20 minutes)
 - a. Design flow
 - b. Work through design flow example problem
 - c. Population equivalent
 - d. Check Your Understanding questions
- 6) Flow Rate and Velocity Measurement (40 minutes)
 - a. Relationship between flow rate and velocity measurement
 - b. Measuring velocity by using simple methods that involve floating objects
 - c. Work through flow rate example problem
 - d. Watch 2 course videos
 - e. Work through velocity measurement example problem
 - f. Check Your Understanding questions
 - g. Work through example problem to estimate the average pipe velocity using tracer dye method
 - h. Estimate velocity using the float method
 - i. Learn about monitoring instruments
- 7) Flow/Velocity Calculation and Estimation (20 minutes)
 - a. Estimate velocity and flow rate in pipes using the Manning Equation
 - b. Work through Manning Equation example problem
 - c. Check Your Understanding questions
- 8) Inspecting and Testing Collection Systems (40 minutes)
 - a. Work through CCTV inspections and pressure testing of pipes example problem
 - b. Work through inspection and testing example problem
 - c. Learn about air (pressure) testing of pipes
- 9) Final Exam (120 minutes)

Course Format:

This course will be delivered online.

Assessment Methodology:

Cumulative online assessment (final exam, 120 minutes)

Prerequisites: None

Textbook: None

Recommended Reading: "Operation and Maintenance of Wastewater Collection Systems," Volume 1, Seventh Edition. Office of Water Programs, www.owp.csus.edu