COLLECTION SYSTEMS WORKSHOP – DAY 1

LEARNING OJECTIVES -COLLECTION SYSTEMS BASICS

Skill Objective
At the end of this training, the participant will be able to:
Distinguish between central and satellite treatment facilities. Define the three main types of collection systems: sanitary, storm, and combined.
Understand typical per capita wastewater generation rates and peak hour peaking factors. Estimate expected flow rates at defined points in the collection system given information about land usage.
Identify major components of collection systems.
Explain why minimum velocities and slopes are desirable.
Calculate velocity for full and half-full pipes. Explain factors that complicate calculating velocity in gravity sewer lines and explain why field measurements are needed for greatest accuracy. Explain desired velocity ranges.
Define depth to diameter ratio and explain why pipes with a d/D of 0.8 discharge the same flow as pipes with a d/D of 1.0.
Describe alternatives to gravity sewers including pressure sewers, STEP and STEG systems, and vacuum sewers.

LEARNING OBJECTIVES – CENTRIFGUAL PUMPS

Skill Objective
At the end of this training, the participant will be able to:
List the defining characteristics of a centrifugal pump.
Identify the major components of a centrifugal pump and give the purpose/function of each piece. Explain the underlying principles of centrifugal pump operation.
Visually inspect cavitation damage on an impeller and determine whether the root cause of cavitation is upstream or downstream of the pump. List at least five potential causes for pump cavitation.
Discuss different types of centrifugal pumps and state where each type might be applied.
Calculate water, brake, and motor horsepower.
Interpret a pump curve diagram.
Use the pump affinity laws to calculate the new flow output, discharge head, amp draw, and brake horsepower for a pump after either the impeller diameter or motor speed has changed.

LEARNING OBJECTIVES – ODOR CONTROL

Skill Objective
At the end of this training, the participant will be able to:
Understand that perception of odor is significantly different from one person to another.
Understand that most odor causing compounds in wastewater contain sulfur and are generated through biological activity.
Be aware that some odors -- hydrogen sulfide and carbonyl sulfide -- are significant health and safety risks for wastewater workers.
Compare and contrast different methods for controlling odors in the collection system. Compare and contrast approaches to odor control including preventing odor causing compounds from forming, keeping odor causing compounds in solution, and chemically treating the wastewater to precipitate or destroy odor causing compounds.

LEARNING OBJECTVES – COLLECTION SYSTEMS MATH

Skill Objective
At the end of this training, the participant will be able to:
Select the correct formula from the ABC formula sheet for solving common collection systems problems.
Convert units from one form to another. For example, convert ft/s to mph.
Calculate area, volume, hydraulic detention time, velocity in an open pipe or channel, and pump horsepower.
Follow the order of operations when solving math problems.
Rearrange equations to solve for an unknown.

LEARNING OBJECTIVES – CONFINED SPACE ENTRY

Skill Objective
At the end of this training, the participant will be able to:
Understand why workers don't always follow proper procedure when entering a confined space. Risk versus reward.
Define a confined space and a permit required confined space.
Describe the goals of a confined space program.
Recite the permissible entry limits for oxygen, flammable gases, airborne dust, hydrogen sulfide, and carbon monoxide. Describe the potential hazards associated with each. Become familiar with a typical confined space entry permit.

| List the duties of the entrant, attendant, and supervisor. |
| Describe the procedure for a non-entry rescue. |
| Complete the entry permit and safely participate in a confined space entry. |

LEARNING OBJECTIVES FOR MANAGING SANITARY SEWER OVERFLOWS (SSOs)

Skill Objective
Understand required reporting procedures for a sanitary sewer overflow.
Clean-up a sanitary sewer overflow and mitigate impacts to the environment and public health.
List the major causes of SSOs.
Understand how to prevent SSOs from occurring.

COLLECTION SYSTEMS WORKSHOP – DAY 2

LEARNING OBJECTIVES – LIFT STATIONS

Skill Objective
At the end of this training, the participant will be able to:
Describe the major components of dry pit and wet pit lift stations including four different methods of level control.
Identify different types of valves in a typical lift station and the purpose of each.
Understand why the flow output from two pumps discharging into the same force main will be slightly less than the sum of the flows when each pump is operating independently.
List routine maintenance tasks and their recommended frequency.

LEARNING OBJECTIVES – PRETREATMENT PROGRAM

Skill Objective
At the end of this training, the participant will be able to:
Understand that municipal wastewater treatment plants have three types of capacity: hydraulic, organic loading, and solids handling and that each type of capacity must be protected.
Understand the potential impacts of industrial waste streams on municipal wastewater treatment plants and the need for a pretreatment program.
Identify when a WWTP might be required to have a formal pretreatment program. Categorize user types as significant, categorical, or non-significant.
Discuss the potential for prohibited discharges, pass-through, and interference from industrial users.
Explain the concept of local limits and give two specific examples of why a local limit may be needed.

Discuss enforcement mechanisms available when an industrial user is in significant noncompliance.

LEARNING OBJECTIVES - CLEAN, INSPECT, AND TEST

Skill Objective
At the end of this training, the participant will be able to:
Recognize the importance of accurate system maps as part of asset management.
Identify and assess bellies, sags, offset joints, and cracks in collection system pipes.
Describe the components of a successful grease control program.
Identify and assess protruding taps, horizontal bores through pipes, and roots as three types of blockages in sewer pipes.
Differentiate between sources of inflow and sources of infiltration
Discuss causes of surcharging and how I&I can cause surcharging and sanitary sewer overflows.
Identify potential sewer and manhole damage from surface evidence such as cracked pavement.
Complete a manhole inspection form and list possible causes of grit and/ow water accumulation in manholes.
Assess potential for sewer damage and presence of cross-connections with smoke testing.
Understand the principals behind dye testing and its use in proving a positive connection.
Understand the importance of accurate records, system maps, and asset attribute tracking.
Evaluate footage from CCTV sewer line inspections. Code and rate various types of deficiencies depending on severity. List steps for start up and shut down of CCTV cameras.
Discuss the basic principles behind sewer balling and the potential for flooding service lines.
Explain how hydraulic jetting of sewers is performed with an emphasis of selecting the correct jet head for the task at hand.
Explain the basic function of bucket machines and list their advantages and disadvantages.
Explain the basic function of rodding machines and identify which types of blockages are best suited to rodding machines.

LEARNING OBJECTIVES – COLLECTION SYSTEM MATH

This math session builds on skills learned on day 1 and adds new problem types.

Skill Objective
At the end of this training, the participant will be able to:
Calculate the percent slope of a pipe between two manholes.
Calculate pump run time cycles. Determine wet well working volumes for a lift station.

LEARNING OBJECTIVES – GROUP EXERCISES

The group exercise consists of dividing attendees into small groups of three to four attendees each. Each team participates in a Jeopardy style quiz-show competition consisting of two rounds of 30 questions each. Instructor led student discussion follows each incorrect answer.