

Collection System Maintenance: Part 1

"What secrets lie beneath your streets?"

Conducting an Investigative Tour of your Subterranean Sewage Collection System

FEATURING:

Sewer Televising
Smoke Testing
Flow Monitoring
Inspections
System Mapping



Municipal Staff Tours Begin Here

SEWER TOUR MYSTERIES PRESENTS



Part 1: Investigative Underground Tours

A collection system is an underground network of both sanitary and storm water collection lines. Your tour begins as you roam the subterranean areas beneath your streets to unlock the mysteries of how your collection system is working. Many collection systems were installed 30, sometimes 60 years ago, so consider your visit a history tour.

If your collection system has not been well maintained, the investigative tour may reveal broken pipes and collapses, accumulated scum and grease from decades of use, tangles of tree roots, corroded manhole covers and iron pipes, rats and mice, or illegal connections to the sewer to dispose of miscellaneous fluids in an “out-of-sight, out-of-mind” manner.

Too much flow or constricted areas in sanitary sewer pipes can cause overflows or backups of wastewater into homes and businesses. Excess groundwater (infiltration) and rainwater (inflow) can enter the collection system from cracks and holes in sewers and manhole covers. Illicit discharges of cooling water and illegal plumbing connections can also create flows which exceed the capacity of the sanitary sewer pipe. Overflows and basement backups of untreated wastewater may spread disease and cause environmental damage.

A wastewater system is usually a community’s largest infrastructure investment. Identifying and fixing problem areas in your sewage collection system maximizes the useful life and performance of this asset, and also protects the public health and welfare of your community.

This brochure explains the tools you will need for the investigative tour. You may choose to use one or more of these methods on your tour. Each tool will give you different types of information to assess the condition of your collection system. Once your investigation is completed, you will have a better understanding of where excess water enters your collection system, and where the flow of wastewater is constricted. Enjoy the tour – and ensure your community’s health!

Sewer Line Televising

Sewer line televising using digital cameras produces a visual record of the sanitary sewer which can be reviewed at a later date. A detailed diagnosis of the condition of the sewer is made without the need for excavation. A robotic camera is lowered into a sewer line through manholes. The camera's speed, direction, and angle of perspective can be controlled to digitally record and document the visual image of a sanitary sewer pipe's interior. Photographs are referenced in a log book according to date, time, and location for documentation.

Televising is usually conducted during low flow conditions in the sewer lines. The camera can travel as far as 500 feet before it should be moved to another manhole downstream. Cameras may also be fitted with wheels or tracks that allow it to travel through different types of pipes, such as concrete, clay, or polyvinyl chloride.



Blockages from scum, dirt, debris, grease, and roots are detected visually from digital photos. Cracks, holes, and breaks in sewer lines are also identified. Illicit discharges of cooling or heating water and other fluids can also be detected. Once these types of problems are documented, a maintenance plan to correct them can be developed.

Smoke Testing

Smoke testing is used to locate broken wastewater lines, infiltration problems, odor complaints, illegal connections, and leaks in the system, or reports of small animals in wastewater lines.

Odors may be caused by a missing clean out cap; a loose, broken, or missing manhole cover; or dead animal in the line.

Smoke-filled air is forced through a sewer line and connection lines under pressure at one or more manholes. Once the pressure exceeds atmospheric pressure, smoke comes out through any openings. As long as openings exist for the smoke to follow, smoke tests are effective for most surface types, soils types, and depth of lines.

Affected customers should be notified in advance of the smoke testing investigation. It is preferable to perform the smoke tests during dry weather because rain or mist reduces the visibility of the smoke-filled air.

Flow Monitoring

Flow monitoring equipment is used to identify areas of the collection system that have rainwater inflow or groundwater infiltration problems, often referred to as I/I. Flow monitoring can also detect areas where surcharging may occur because the volume of wastewater to be carried is greater than the capacity of the sanitary sewers to convey that amount of flow. Surcharging problems can result in sanitary sewer overflows when wastewater rises to the top of a manhole and flows out onto the street or ground.



Flow meters are placed at varying locations throughout the collection system. These meters measure the amount and rate of wastewater flow in the sanitary sewer lines. The monitors are left in place for a specified period of time. Data is collected and compared to rainfall amounts over the same period. Measurements taken before and after a rainfall event indicate how much I/I contribute to the total flow of wastewater in the collection system.

Manhole Inspections

Visual and televised inspections verify that manholes and cleanouts are on proper grade and are accessible to maintain sewer lines. Sewer line maps which indicate distances to fixed objects such as hydrants, telephone poles, street lights, etc. from installed manholes can be used to locate manholes or cleanouts that are paved over or concealed.

Manhole inspections are a relatively quick and inexpensive way to detect holes and leaks that allow rainwater or groundwater to enter the collection system. Inspections identify:

- The exact location of the manhole.
- The need for grade adjustments.
- Leaks or holes in the cover or frame.
- Evidence of rainwater ponding on the manhole cover.
- The area that drains storm water into a leaky manhole.
- The condition of benching, rises, grade rings, and collar.
- The condition of sewer pipes and lateral connections.



Lift Station Inspections

A lift station is an installation of pumps that raise wastewater from areas too low to drain by gravity into sanitary sewers. A typical weekly lift station inspection should include observations that confirm:

- Alarm systems are operating properly.
- Wet well levels are properly set.
- All indicator lights and voltage readings are within acceptable limits.
- Suction and discharge pressures are within normal limits.
- Pumps run without excessive heat or vibration and have the required amount of lubrication.
- Belts show no excessive wear.

Sewer Lateral Inspections

A sewer lateral, also known as a “house lateral” or “building sewer”, is the section of connecting sewer pipe from a building structure to the main sanitary sewer. Sewer laterals collect untreated wastewater from buildings and convey it to a main sanitary sewer pipe. Building sewers are usually maintained by the property owner.

Inspections are performed on private laterals to detect illegal plumbing connections of:

- Roof downspouts.
- Groundwater sump pumps.
- Foundation drains.
- Drains from window wells, driveways, etc.

Rainwater from these sources should go to storm sewers, drainage ditches, rain gardens, or other areas where it can soak into the ground.



Inspections can also help you detect basement back-ups of untreated wastewater or odor problems caused by blockages or flow constrictions in the lateral from:

- Tree roots.
- Dirt, sand, or scum.
- Oil and grease.
- Pipe collapses.
- Rodents.

Inspections can be performed visually or with video inspection equipment. It is usually the homeowner’s responsibility to clean and repair sewer laterals.

For more information on sewer laterals, see the “Building Sewer Maintenance and Repair” brochure which can be downloaded from:

<http://www.dnr.state.wi.us/org/water/wm/ww/cmar/brochures.htm>

Safety Caution:



Sanitary sewers may contain harmful gases such as hydrogen sulfide or methane, or low concentrations of oxygen. Hydrogen sulfide gas is produced by anaerobic bacteria in slow moving wastewater. This gas is a major source of odors in collection systems and smells like rotten eggs. Heavier than air, hydrogen sulfide gas is often in the lower portion of manholes.

If the concentration of hydrogen sulfide or methane gas is high enough, unconsciousness will come suddenly to workers exposed to this gas. Each collection system utility should have a confined space safety program that includes a written plan, entry procedures, and the appropriate three gas monitoring meters for hydrogen sulfide, methane, and oxygen.

When entering a manhole, use the proper safety harness, calibrated gas detection devices, and ventilation equipment. For more information, see the Occupational Safety and Health Administration confined space regulations at this web site: <http://www.osha.gov/SLTC/confinedspaces/index.html>



Physical Inspections and Mapping:

The physical inspection and mapping process is an important part of an Operation and Maintenance (O & M) program. Inspection activities provide a detailed inventory, location, and condition assessment database that is essential for efficient O & M planning, scheduling, and emergency response operations. Inspections should be performed regularly as part of the preventive maintenance program.

Physical inspections are performed to meet the following O & M goals:

- Inventory and map the system's pipe size, length, and type; manhole locations; and valve locations.
- Assess the condition of the system.
- Find defects in the system that can cause backups, overflows, and bypasses of untreated wastewater.
- Identify chronic problem areas so maintenance can be scheduled.
- Locate illicit discharges and problems that could result in future failures.
- Determine long-term replacement costs, rehabilitation needs, and user charges.
- Determine rates of deterioration.

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Credits/Contacts:

The brochure can be downloaded from: <http://www.dnr.state.wi.us/org/water/wm/ww/cmar/brochures.htm>.

References used in the production of this brochure:

- "Optimizing Operation, Maintenance, and Rehabilitation of Sanitary Sewer Collection Systems", December 2003, New England Interstate Water Pollution Control Commission.
- "Collection Systems O&M Fact Sheet: Sewer Cleaning and Inspection", September 1999, United States Environmental Protection Agency. EPA 832-F-99-031.

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For information on collection system operation and maintenance classes, see the University of Wisconsin, Madison, Department of Engineering Professional Development web site: epd.engr.wisc.edu.

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