

**COUNTY OF LOS ANGELES
DEPARTMENT OF PUBLIC WORKS**

**SEWER MAINTENANCE DISTRICTS'
MAINTENANCE AND OPERATIONS MANUAL**

A handwritten signature in black ink, appearing to read "Keith E. Lehto", written over a horizontal line.

Approved by
Keith E. Lehto
Assistant Deputy Director
Sewer Maintenance Division

January 25, 2012

SEWER MAINTENANCE DISTRICTS' STANDARD MAINTENANCE OPERATIONS MANUAL

INTRODUCTION

The County of Los Angeles Sewer Maintenance Districts (Districts) are administered by the County of Los Angeles Department of Public Works (Public Works) and consist of the Consolidated Sewer Maintenance District and the Marina Sewer Maintenance District. The Districts' system serves over 500,000 parcels and a population of approximately 2.3 million people within the unincorporated areas of the County of Los Angeles (County), 37 cities, and 3 contract cities. The Districts' system includes over 4,600 miles of sanitary sewers, 154 pump stations, and 4 wastewater treatment plants. The estimated value of the Districts' system is more than \$1.5 billion dollars with the Districts' annual operating budget of about \$60 million dollars. Sewer maintenance services are provided from four maintenance yards located throughout the County.

The Districts' approach to achieving a successful sewer maintenance operation is the implementation of a proactive preventive sewer maintenance program, a sound emergency response plan, and the establishment of an adequate funding source. The cornerstone of the Districts' operation is its preventive maintenance program. The Districts' standard maintenance and operation methods, based on the industry Best Management Practices (BMP), are described herein.

PROACTIVE SEWER MAINTENANCE PROGRAM

The goal of a proactive maintenance program is to detect and mitigate potential problems before they develop into major problems. A preventive sewer maintenance program consists of mandating minimum design standards for construction, regular inspection of the sewer system combined with as-needed cleaning, timely detection and repair of damages and other problems, and good safety practices.

The objectives of a preventive maintenance program are as follows:

- To protect the health and welfare of the community being served by ensuring the continuous uninterrupted operation of the public sewer system.
- To protect the considerable public investment in the sewerage system by keeping its capacity to a maximum and maintenance practices to maximize its useful life.
- To protect the storm drain system and receiving waters from the impact of sewage overflows through the consistent implementation of appropriate BMP.
- To provide 24-hour service to respond to complaints from citizens.

Program Implementation

The following is a summary of the various elements of the Districts' preventive maintenance program:

I. Inspection – Activities, Frequencies, Checklist/Potential Problems

A. All Sewer Manholes (Semiannual)

1. Manhole top to be leveled with adjacent pavement.
2. No settlements over sewer line.
3. Interior of manhole to be free of debris, vermin, etc.
4. Manhole steps secured.
5. Flow conditions to be normal – not over ½ pipe diameter, smooth flow, and smooth flow confluence in junction chambers.
6. Stoppage or restrictions.
 - a. Usual material (sticks, rags, grease, garbage grindings, sand, and root growth).
 - b. Unusual material (large rocks, metal objects, plumber's plugs, etc.)
7. No presence of vermin or roaches.
8. Miscellaneous
 - a. No deleterious industrial waste.
 - b. No odors.

B. Gas Trap Manholes (Monthly)

1. To be free of stoppages or restrictions.

C. Siphons (Monthly)

1. To be free of stoppages or restrictions.

D. Drop Manhole (Variable Frequency)

1. To be free of stoppages or restrictions.

E. Gas Detection

1. All manholes are tested prior to being opened for presence of explosive and sulphurous gases and/or oxygen deficiency.

II. Cleaning

A. Sewers

1. Enhanced maintenance schedule for sewer hot spots or planned periodics (monthly, quarterly, or semiannual).
 - a. Periodic cleaning of sewers known to accumulate grease, garbage grindings, or root growth.
2. Planned nonperiodics.
 - a. Cleaning as disclosed by inspection.
 - b. Cleaning for sewer line condition assessment (at a minimum once every 10 years for each pipe segment).

B. Gas Trap Manholes and Drop Manholes

1. Cleaned at time of inspection.

C. Siphons

1. Periodic cleaning or as called for by inspection.

III. Treatment Plants and Pumping Stations

A. Sewage Pumping Plants (Twice per Week)

1. Check and lubricate pumps and motors.
2. Check control mechanisms and valves.
3. Adjust control mechanisms when necessary.
4. Repair and modify equipment when necessary.
5. Clean wet wells or sewage receivers as necessary per BMP.
6. Building, structure, and ground maintenance per BMP.

B. Treatment Plants (Daily)

1. Station coverage as required by permit.
2. Conduct all permit-required sampling and testing.
3. Adjust control mechanism as necessary.
4. Perform routine daily maintenance and calibration of equipment.
5. Maintain BMP
 - a. General facility wash down and housekeeping.
 - b. Monitor level of solid-holding tanks and arrange hauling of sludge as needed.
6. Check mechanical component and process unit.
7. Perform periodic maintenance and cleaning of equipments.
8. Document operational data and visual observations.

IV. Other Services and Functions

A. Complaints and Emergencies (Also see next section)

Personnel are available 24 hours each and every day of the year to receive and act on any complaints received regarding the mainline sewer system.

1. Sewer maintenance personnel investigate all complaints relative to mainline sewers and take immediate corrective actions.

B. Television Inspection

1. Closed-circuit televising (CCTV) of interior of sewer pipes for sanitary sewer overflow or floodout investigation as necessary.
2. CCTV of interior of sewer pipes for structural and maintenance condition assessment at a minimum once every 10 years for each pipe segment.

C. Construction

These services are provided as a result of routine inspection or in response to a service request from the public or other entities.

1. Sewer line repaired as necessary.
2. Manhole covers are silenced, sealed, or adjusted to grade.
3. Manholes constructed or reconstructed.

D. Vermin and Roach Control

1. Sewers and structures are dusted or baited when evidence of infestations are observed during an inspection or in response to a service request or complaint.

E. Taps and Saddles

1. Mainline sewer tapping and the installation of wye or tee saddle for connection to the public sewer is handled by skilled sewer maintenance personnel only. A fee is collected to cover the cost of the installation.

F. Industrial Waste Control (Districts and Contract Cities)

1. Public Works Environmental Programs Division performs periodic and special inspections to prevent the discharge of waste that cause excessive maintenance, present a danger to crews, or are harmful to the system.

G. Radio/Telephone Communication

1. All Public Works Crew Leaders and Electro-Mechanics have County-issued cell phones.
2. Sewer maintenance vehicles are equipped with two-way Mobile Radio units and can be reached immediately during regular working hours.
3. Treatment plants and a majority of the pump stations are equipped with telemetry systems.

V. Emergency Response

The Districts provide 24/7 emergency sewer services. The emphasis of responders to these services is the timely delivery of service, protection of the communities' health and safety, protection of private property, employee safety, implementation of established corrective action measures, and prompt reporting to regulatory agencies when required. The Districts' established policy for response time, response activities, and reporting procedures for various types of emergency calls are as follows:

A. Sanitary Sewer Overflows and Floodouts

1. Response Time.
 - a. Two hours (Districts' Sewer System Management Plan (SSMP) and the attached Emergency Response Procedures).
2. Response Activities.
 - a. Spill containment.
 - b. Secure site.
 - c. Breakdown stoppage.
 - d. Spillage removal by Hydrovac.
 - e. Site cleanup.
 - f. Spill volume estimation.

- i. Preliminary Estimate (by responding crew)
 - California Water Environmental Association visual method.
 - Spillage puddle geometric shape and depth method (Volume = Area x Depth).
 - ii. Spill Volume Confirmation (Hydraulic calculations by Office engineering staff).
 - Gravity System.
 - Volume calculation based on number of manhole cover pick holes, manhole diameter, height of discharge from pick holes, and manhole rim and spill duration.
 - Volume based on calculated total volume (sewage flow rate in the pipe x flow duration) minus system holding capacity.
 - Pump Stations
 - Volume based on pumping or discharge rate of operating pump(s) multiplied by spillage duration minus system holding capacity.
3. Reporting to Authorities (Per State General Waste Discharge Requirements and SSMP).
 - a. State Water Board through the California Integrated Water Quality System.
 - b. Regional Water Quality Control Board.
 - c. County Health Department (by phone within 15 minutes of spill notification).
 - d. Flood Maintenance Division for spills reaching the storm drain only as soon as possible.
- B. Fats, Oils, and Grease (FOG) and Root Stoppage-Related Issues (Per SSMP)
- 1. Response Time.
 - a. Within two hours.
 - 2. Response Activities.
 - a. Hydro cleaning or rodding.
 - b. CCTV inspection.
 - c. Door hangers for repeated FOG issues.
 - d. Chemical root treatment (foaming).
 - 3. Reporting to Authorities.
 - a. Public Works Environmental Programs Division for follow-up investigation and possible enforcement actions for repeated FOG incidents.

- C. Other nonlife threatening service requests such as odor problems, insects or rodents infestation, noisy manholes, tree roots, etc., are handled as described below or as indicated or demonstrated elsewhere in this document and other Districts' documents.
 - 1. Response Time.
 - a. Within 24 hours.
 - 2. Response Activities.
 - a. Hydro-jet cleaning for odors.
 - b. Chemical dusting for insects.
 - c. Baiting for rodent.
 - d. Rodding, root saw, or chemical foaming for tree roots.
 - e. Locking down of loose manhole covers.
 - f. Other remedial actions as determined by responding crews with the approval of a Field Superintendent or Supervisor.
 - 3. Reporting to Authorities.
 - a. Public Works Environmental Programs Division for nonsewage odors only.
 - b. City or Public Works Road Maintenance Division (when necessary).

VI. Safety Issues

Maintenance workers, construction crews, electro-mechanics, and treatment plant operators are provided with all necessary Personal Protective Equipment for occupational exposure to potentially infectious materials found in wastewater. They are also given proper training in the avoidance of construction-related injuries, handling of hazardous substances, and working in hazardous environment. Sewage workers are trained to exercise caution and adhere to established safety rules to avoid serious bodily injuries or death.

Sewage operators can be infected by disease causing microorganisms through contamination by direct contact with sewage on skin abrasions, cuts, nicks, dermatitis, and acne or by sprays, mist, or splashes on mucous membranes of the eyes, nose, and mouth. They can also be infected by indirect transmission of microorganisms by touching contaminated surfaces or consumption of contaminated foods. The most common diseases associated with sewage works are Typhoid fever, Hepatitis B, and Tetanus.

Some of the necessary safety precautions for sewage workers are presented below:

A. Construction Workers

1. Use of proper and well maintained equipment.
2. Proper training in construction technique – excavation, shoring, traffic control, etc.
3. Use of bright uniforms and adequate lighting.
4. Use of appropriate protective gear – hardhats, boots, gloves, etc.

B. Maintenance Workers/Electro-Mechanics/Treatment Plant Operators

1. Use of personal protective equipment.
2. Practice of common personal hygiene.
3. Training in confined space entry.
4. Voluntary immunization against diseases like Typhoid, Tetanus, Hepatitis B, etc.
5. Practice good housekeeping.
6. Good driving practices.
7. Periodic medical check-ups.
8. Bright uniforms.
9. Awareness of hazardous materials or chemical handling.
10. Training in proper work techniques.

VII. Financing

The operation of a public sewer system should be self sustaining. Many factors must be considered in determining the costs of providing wastewater service. Cost of service studies are important as guides for determining the necessity for and level of rate adjustments to be considered in recovering costs equitably from the wastewater system customers.¹

The primary objective of a rate schedule is to establish a fee that will generate sufficient revenues to meet total operational expenses and derive revenues from the customer classes and individual customers, as closely as possible, in accordance with the cost of their service requirements. The selection of cost allocation parameters, the use of average service requirements by customer classes where it is impractical to measure them, and the careful design of schedule of charges ensure that rates are reasonable, fair, and equitable to all users and relatively easy to administer.¹

¹ Financing and Charges for Wastewater Systems. APWA, ASCE & WPCF. (1984).

A. Sewer Service Charge Rate Determination Methodologies

1. The only method for assessing entirely equitable charge for sewer service would be to determine each customer's charge based on individual service requirements. (Exact flow, strength, etc.) However, the actual measurement of all individual service parameters is impractical.
2. Readily obtainable units that reasonably approximate average wastewater service requirements for groups of customers are acceptable.
3. The appropriate billing units may vary for each of the customer classes depending on the wastewater characteristics for that class.
4. Customer billing units may be uniform for each customer per billing period – Flat rate.
5. Customer billing units may reflect the varying sizes of customers by using a relationship between the size of the customer's water meter, wastewater discharge connection, lot's front footage, building fixture units, or other factors.
6. Customer billing units may reflect varying strength of the waste generated such as Biochemical Oxygen Demand, Total Suspended Solid, etc.

Our Districts' operations are funded through assessment of annual sewer service charges (for Consolidated Sewer Maintenance District cities and unincorporated County only). The current basic annual sewer service charge for the Consolidated Sewer Maintenance District is \$32.50 per sewage unit (equivalent single-family dwelling) and an additional \$8 per sewage unit annually for the Accumulative Capital Outlay Fund for sewer rehabilitation and replacement. The Marina Sewer Maintenance District is \$190 per sewage unit. Multiple-family dwellings and commercial or industrial properties pay multiples of these basic charges based on the Land Use Codes assigned to them by the County Assessor's Office. Sewer service charges are collected on the annual property tax bill.

VIII. Sewer Maintenance Equipment and Materials

The following pages contain photographs and brief descriptions of some of the major equipment and tools utilized for sewer maintenance activities. They also show some of the Districts' facilities and field personnel performing assorted tasks under different work conditions.

A. Sewer Inspection

1. Inspection Truck

The inspection trucks are usually 13-series (single-axle trucks with gross vehicular weight (GVW) under 15,000 pounds) utility body type vehicles. In the rear bed of the truck is a reel that houses a minimum of 350 feet of sectional sewer hand rods used for dislodging debris in a sewer line. The hand rods are generally used in easements and right of ways where the truck-mounted rodder can not reach. Other basic tools carried on the trucks are stick getters (for retrieving sticks from manholes), grease choppers (for dislodging grease from the sides of sewer lines and manholes), safety cones along with flags (as needed for traffic control), and manhole bars (for opening of manholes).



2. Televising Truck

The televising truck is a 13-series van type vehicle. It houses a CCTV system for televising underground sewer lines. The system has approximately 1,000 feet of single conductance cable and cameras for inspection of sewer mainline and detailed inspections of suspected problems. Additional equipment carried on this truck is manual and hydraulic plugs to stop or minimize sewer flow in the sections of sewer lines to be televised. The inspection data is inputted via computer onto hard drives.



B. Sewer Cleaning

1. Hydro Truck

The hydro truck is a 21-series (GVW less than 28,000 pounds) vehicle equipped with a mounted 1,500-gallon water tank. It is also equipped with a hose reel that carries approximately 800 feet of 1-inch hydro hose, mounted pumps for pumping water through the hose at 2,000 pounds per square inch, and various nozzles for flushing out debris, such as sand, grease, and roots, in sewer lines. This unit is also capable of operating a mechanical root-cutting tool for heavy root-infested lines. Debris is trapped and removed from the manhole.



2. Hydro-Vacuum Truck

The hydro-vacuum truck is a 28-series (dual-axe truck with GVW under 50,000 pounds) vehicle equipped with a mounted 1,000-gallon water tank. It is also equipped with a hose reel that carries approximately 800 feet of 1-inch hydro hose, mounted water pumps, and various nozzles. This unit also has mechanical root cutting capabilities. In addition, this unit has a mounted vacuum system to remove debris from sewer lines as well as dirt, rocks, and debris from trenches during construction.



3. Rodder Truck

The rodding truck is a 21-series vehicle. This unit is equipped with a mounted rodding unit that consists of hydraulic controlled heads, which are capable of pushing and rotating 1,400 feet of continuous steel rods used for cutting, scraping, and dislodging grease, roots, and debris from sewer lines. Some basic rodding tools are augers, screws, square stocks, and retrievers for broken rods. The rods are guided through a guide hose that extends from the heads into the mouth of the line to be rodded, pushing and rotating simultaneously. Debris is trapped and removed from the manhole.



4. Portable Truck

This unit is a small, dolly-mounted piece of equipment equipped with a 5-horsepower engine, capable of rotating hand rods through a coupling and applying more torque than possible by hand. It is generally used in easements and right of ways.



C. Construction

1. Construction Truck

The construction truck is a 21-series, utility body type vehicle for storage of construction tools such as pipe cutters, saws, hand tools, pipe plugs, hand pumps, and generators for power tools, such as the core drill, for installing line connections, tees, and wyes. The rear is used for transporting shoring sheetings and pipes. This unit also has a mounted crane used for loading, unloading, and lowering pipes (vitrified clay, plastic, or ductile iron) into trenches as well as a mounted winch used for balling sewer lines to remove debris.



2. Backhoe

The backhoe is for excavation for mainline installations/repairs. This unit is used for loading sand, gravel, cement, and bricks onto trucks for transportation to or from jobsites. The bucket is used for moving spoils and loading broken pipes, concrete, asphalt, and materials too heavy to load or unload by hand. It also acts as a small grader in construction zones.

3. Compressor with Tools

This unit is a trailer-mounted air compressor used to supply air to the pneumatic tools housed in its bins such as jack hammers (to break pavement constructed of cement or asphalt), chippers (to chip holes in cement walls or skimming surfaces), and tampers (to compact soil in backfilling trenches).



D. Pest Control

1. Dusting Truck

The dusting truck is a portable unit that consists of an engine attached to a compressor mounted on a platform with a holding tank for roach powder. This unit, when loaded and running, pushes dust through a hose equipped with a valve for on and off operation. This unit, when needed, is loaded onto a flatbed truck or inspection truck. The unit has a five-foot wand. When the vehicle stops at a manhole, the wand is placed inside a pick hole of that manhole cover. The valve is then opened for the manhole to receive a gauged amount of dust. Finally, the valve is closed to end the application. The vehicle then moves to another manhole and the application process is repeated. This continues until the prescribed area is completely dusted.



2. Rat Baiting

Rat baiting is performed from the back of an inspection truck. The area to be baited is usually identified during inspection through observations of droppings and suspected nests in the area. Rat bait is dropped onto the shelves at the bottom of the manholes until the prescribed area is completed.

3. Stinging Insects

When stinging insects, such as ants and/or spiders, are present in manholes that have to be entered, spray cans can be used for immediate elimination of the problem. The County Agricultural Commissioner is used to eliminate bee or wasp nests from manholes.

E. Root Control

When the need to control roots in the sewer lines exists, the rodder may be used as the first step. The line is rodded, tearing and pulling roots from the line to reestablish flow. In cutting, the rodder utilizes an appropriate auger sized for the sewer line. The auger is pushed from one manhole to the next upstream manhole and then pulled back through the line. In some cases, the auger is replaced at the upstream manhole with another tool, such as a root saw or a square stock, and pulled back to the downstream manhole.

Another method of removing roots from sewer lines is with the use of various hydro-powered root saws such as a wart-hog, chain flail, or other cutting tools. It is a mechanical unit that is attached to the end of the hydro hose.

1. Root Cutter

This unit is used with the hydro truck. The mechanical unit employs two hardened steel chains attached to a rotating axle. The length of the chains depends on the size of the line to be cleaned. The unit is attached to the end of the hydro hose. Water pressure from rear jets forces the unit through the line. In doing so, the rotating chain beats a path through the root-infested line, grinding the roots small enough to float away.



2. Foaming for Root Control

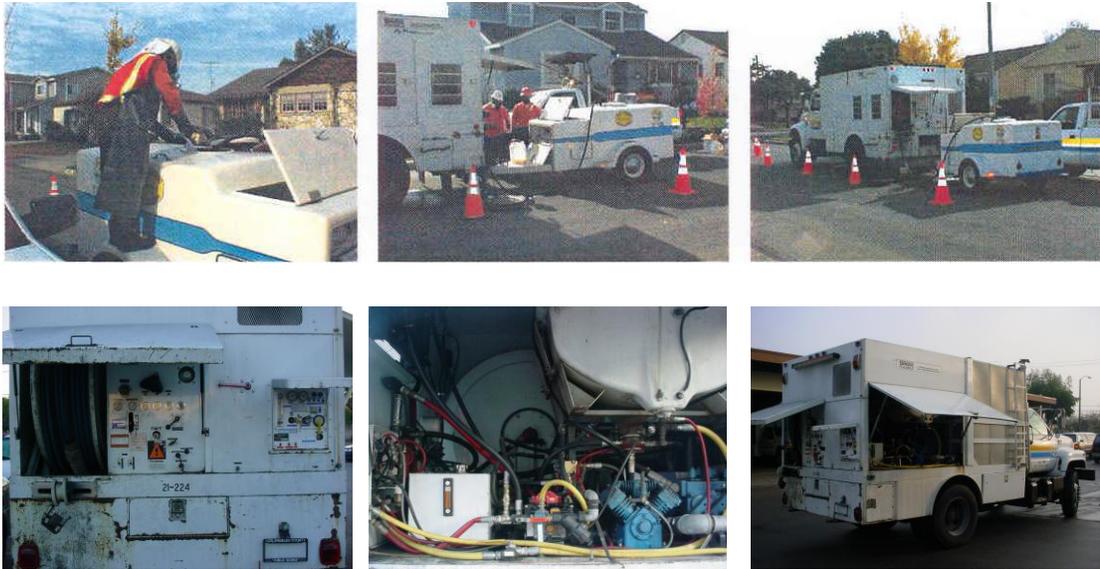
The preparation for applying foam to a sewer line begins with cutting and removing as much of the root growth as possible. Upon completion of the cutting process and after a prescribed waiting period, defined by the manufacturer of the chemical to be used, the application starts. The application process will usually be specified on the container with the Material Safety Data Sheet available to the user for proper use and handling.



3. Foaming Unit

The foaming unit is an engine-driven, truck-mounted unit. It has a holding tank for chemical mixing. The unit is connected to the hydro through a three-way valve. This valve allows the chemical to pass through the hydro into the hydro hose. The chemical is poured into the holding tank with a foaming agent. Water is added as specified. The unit agitates the mixture, sending it out as foam through the hydro hose. The application is executed by the hydro, sending the hose up the line through the area to be foamed or to the upstream manhole. The foamer is turned on and foam starts to flow.

The hydro hose is pulled back, dispelling a stream of foam, filling the pipe, and allowing the foam to adhere to root ends.



F. Odor Control

In an environment devoid of oxygen, anaerobic bacteria decompose organic materials in sewage, producing foul smelling “sewer gas.” The major components of sewer gas can include hydrogen sulfate, carbon dioxide, and methane. The presence of sewer gas at significant concentrations may result in dangerous conditions due to its toxic nature and asphyxiation from displaced or consumed oxygen.

The control of odors has become a major consideration in wastewater facilities including sewerage collection systems, pumping stations, and treatment plants. Control of odor can be accomplished by injecting air or oxygen (by blowers, compressors, etc.) into the wastewater to prevent the sewage from turning septic.