

**CHAPTER 8**  
**MATERIALS AND EQUIPMENT**

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**INTRODUCTION**

The tools, equipment, and materials required to effectively operate a preventive maintenance program depend on the size, age, and condition of the collection system as well as the work load and objectives of the program. To determine what equipment is needed, an analysis of the system needs to be done to determine what problems occur in the system and what equipment is required to correct the problems. The following lists of equipment required for several operations should serve as guidelines. It is the responsibility of all collection system workers to determine if this equipment is adequate for the proper operation and maintenance of the system.

**YARDS AND SHOPS**

The yards and the shops of the collection system agency should be adequately equipped with the following:

1. Storage for all materials which cannot be stored on the maintenance vehicles including pumps, compressors, and other large equipment.

2. Office storage for maps, records, etc.
3. Personnel facilities including a locker room with showers, laundry facilities, and a lunch room.
4. A fuel storage area.
5. A machine shop.
6. A storage room for all safety and personal protection gear.
7. Adequate yard lighting and fenced enclosure.
8. Adequate parking for service vehicles and employee owned vehicles.

The trucks used by the foreman and the various crews should be:

1. Capable of carrying a crew of 3-6 people, tools and equipment.
2. Capable of transporting an air compressor.
3. Equipped with outlets and piping around the truck body.
4. Equipped with many locked storage compartments for equipment storage.
5. Equipped with a water tank for cleaning operations.
6. Painted bright, eye-catching colors for high visibility.
7. Supplied with blinking lights and roadway flares to serve as warnings.
8. Supplied with a two-way radio.

Each truck should be equipped with the following tools and equipment depending on the intended operations:

1. Pumps.
2. Rods.
3. Root cutters.
4. Generators.
5. Blowers.
6. Ducts.
7. Fire hose and flushing nozzles.
8. Hydrant wrench.
9. Air gap device.

10. Shovels
11. Picks.
12. Hammers.
13. Non-sparking tools.
14. Traffic cones.
15. Barricades.
16. Axes.
17. Buckets.
18. Rubber boots.
19. A minimum of 25 feet of rope.
20. Explosion-proof flashlights.
21. First-aid kits.
22. Wire brushes.
23. Maps.
24. Atmospheric testing equipment.
25. Gas calibration cartridges.
26. Fire extinguishers.
27. Self-contained breathing apparatus (SCBA).
28. Broom.
29. Cement working tools.

## **MAINTENANCE EQUIPMENT**

Specific equipment usually required for maintenance includes:

1. Testing and sealing equipment used with closed circuit television.
2. Sewer balls, available 6 to 48 inches in diameter. Those greater than 12 inches become expensive. Buy the common sizes and rent the uncommon sizes as needed.
3. Pump with a 1-1/2 to 4 inch discharge.

4. Portable generators. Gas powered generators supply 110 volt power to the field for lights and tools. Truck mounted generators operate from the truck's electrical system and also supply 110 volts.
5. Electronic locaters such as valve or lid locaters and pipe locaters.
6. Inflatable sewer plugs.
7. High velocity cleaners, either truck mounted or trailer units.
8. Closed circuit television equipment.
9. Rodding machines. Although both truck and trailer mounted units are available, if rodding is to be performed full-time, truck mounted is preferable.
10. Bucket machines. These are trailer mounted and used in pairs.
11. Flushing equipment.
12. Maintenance records and forms.
13. Safety equipment such as:
  - a. Atmospheric testing equipment.
  - b. Harness and rope.
  - c. Blower.
  - d. Self-contained breathing apparatus.

## INSPECTION EQUIPMENT

In inspecting sewer lines and manholes, the following equipment is usually necessary in the field, and is therefore normally stored on the maintenance vehicle:

1. Powerful explosion-proof flashlight or mirrors.
2. Maps of system.
3. Manhole lid lifter or other type of lid remover.
4. Scrapers and wire brushes for cleaning the manhole ring.
5. A five or six foot straight edge.
6. Leather gloves.
7. Traffic safety cones, barricades, and flags.
8. Metal detector.

9. Pick and shovel.
10. Chain ladder or aluminum ladder.
11. Rain gear.
12. Inspection records and forms.
13. Safety equipment.

## **SAFETY EQUIPMENT**

The safety of workers is of prime importance in any sewer maintenance program. Although safety guidelines and equipment will be discussed in some detail in Chapter 9, a partial list of important equipment is given here:

**NOTE:** All personal protective apparel, tools, devices, and equipment should meet all requirements and standards as outlined by such agencies as the Occupational Safety and Health Administration (OSHA), the National Institute for Occupational Safety and Health (NIOSH), and the American National Standard Institute (ANSI), etc.

1. Atmospheric testers. These are available as single purpose testers used to detect a specific gas such as carbon monoxide, methane, or hydrogen sulfide; dual purpose testers which detect either lack of oxygen or explosive conditions; and multi-purpose testers with interchangeable parts to allow for measurement of the concentration of several gases. Gas calibration cylinders should be kept to calibrate the meter.
2. Explosion-proof blowers to provide fresh air into confined spaces. These are available as portable or trailer mounted models. They should have a 25,000 cubic foot per minute capacity for projects involving large diameter sewers.
3. Self-contained breathing apparatus (SCBA). SCBA's contain a 30 minute oxygen supply. The air tank is carried on your back. These are used when a blower is not available, when it is questionable if the blower is working correctly, or for rescue operations.
4. Shoring equipment. This is important for projects requiring deep excavations. Hydraulic shoring is widely used, as it is lightweight, and safely and quickly installed and removed from above ground. Manual shoring with wooden timbers is more difficult and time consuming to install and is limited to excavations of small size and depth. Sheet shoring and trench boxes are suitable for loose or running soil conditions.
5. Traffic control equipment such as rotating, flashing beacons, traffic cones and warning signs, high level warning flags, and brightly colored safety vests.
6. Protective clothing including:

- a. Coveralls which should be removed at the end of the working day to minimize contaminating the worker's car or family.
- b. Steel toe safety shoes, with non-skid soles, steel shank and insulation.
- c. Rubber boots for those working in raw wastewater. They should be equipped with safety toes, non-skid rubber soles, and a steel shank.
- d. Rubber gloves to protect against infection and disease.
- e. Leather gloves to protect against scrapes and cuts.
- f. Eye protection such as safety goggles or face shields.
- g. Hard hats.
- h. Safety harnesses.
- i. First aid kits.
- j. Rain/chemical protective wear to protect against exposure to biological and industrial contaminants.
- k. Hydrogen peroxide to clean hands with.
1. Antiseptic shampoo.

## **CONSTRUCTION AND REPAIR EQUIPMENT**

Crews that participate in extensive repair operations or construction of new manholes or sewer lines may have need for the following equipment and materials:

1. Sewer pipe and fittings.
2. Manhole grade rings.
3. Manhole barrel sections.
4. Paving materials.
5. Aggregate and cement.
6. Road rock.
7. Sand.
8. Backhoes for projects of a significant size.
9. Dump trucks with a five-yard load capacity.
10. Water truck with a capacity of at least 1,000 gallons for dust control and clean-up.

11. Portable air compressors for the operation of jack hammers and other pneumatic tools.
12. Truck mounted hoist to lift manhole frames and covers, large pipes, manhole grade rings, and other portable equipment.
13. Internal tap cutters to combat protruding taps where excavation for removal is impractical.
14. Boring equipment.
15. Abrasive cutoff saws.

## ACQUIRING EQUIPMENT

After analyzing the collection system and determining the equipment needs, it is necessary to acquire the equipment that is not already owned by the agency. The options available are renting, leasing, or purchasing equipment, or contracting jobs. Each has its own advantages and limitations, as follows:

### Leasing/Renting

#### Advantages.

- a. Expensive equipment is available without expending initial capital costs.
- b. The problem of not being able to afford better equipment after making a purchase is eliminated.
- c. Leases are usually on a one to three year basis, so equipment used won't become obsolete.
- d. Leasing can be economically feasible for specialized equipment needed to complete one-time or seasonal programs.
- e. Long term storage and maintenance are not required.
- f. Leased equipment that breaks down can usually be replaced quickly.

#### Disadvantages.

- a. The total cost of leasing may be greater than purchasing.
- b. Staff must be hired and trained to use the equipment.

### Purchasing

#### Advantages.

- a. Agency will have standard equipment on hand that is used frequently.

- b. The purchase of new equipment usually ensures better quality and longer life span.

Disadvantages.

- a. Large initial capital investment.
- b. Equipment must usually be kept and used for five to eight years in order to build up an adequate replacement fund.
- c. It is difficult to obtain newer equipment that will do a better job until the older equipment wears out.
- d. Equipment may require specially trained workers to operate and provide proper maintenance.

Contracting

Advantage.

- a. Useful when the collection system agency does not have qualified staff to do a highly specialized job.

Disadvantage.

- a. May be the most expensive alternative, but is satisfactory for a small job that can be done in a short time.