Refuse collection is directly related to the health and welfare of citizens. All communities, regardless of size, must face the problems associated with collection and disposal of refuse. Certain hazards are inherent in the nature of refuse-handling activities, but they will vary with the types of equipment used and the various conditions surrounding the operations. Thus, the circumstances contributing to potential hazards for employees’ injuries will vary greatly among organizations. Experience indicates the importance of management attention to refuse-handling activities in order to motivate employees to maintain the highest level of safety.

1. This data sheet will discuss the hazards pertaining to refuse collection in municipalities and the necessary measures to avoid them.

2. Some organizations operate on an incentive program in refuse collection. Certain “bonuses” grant each worker permission to leave for home when the worker’s route has been completed. This leads workers to work too fast and take chances, putting an added strain on a safety program. However, the incentive system is so ingrained in some organizations that it would be extremely difficult to change.

3. Some crews may pick up more refuse per day than other crews. The greater work load, coupled with the speed of operation, may add even more hazards to an already potentially hazardous job.

4. Refuse collection requires large amounts of costly equipment, as well as enough operating, supervisory and administrative personnel.

Hazard

5. Meaningful statistics on incidents in refuse collections are not numerous, but the few available illustrate the magnitude of the problem. Many incidents involve packing blades, which have caused partial loss of fingers, hands, arms and feet.

6. The National Safety Council collects municipal data to publish the annual Injury Facts. This information is listed by Standard Industrial Classification (SIC) number, and the data are based on the definitions of recordable occupational injuries and illnesses of the record-keeping requirements under the Occupational Safety and Health Act of 1970, revised 1978. Incidence rates are expressed as cases or days per 100 fulltime employees (using 200,000 employee-hours as the equivalent).
7. Nationally, some of the contributing factors to hazards encountered are narrow streets and alleys; inadequate, old or poorly maintained equipment; faulty design; and variation in requirements for size, weight, type and contents of refuse containers and bundles. All of these contribute to the diversity of incidents within various organizations.

8. Some of the hazards faced by refuse collectors arise from the “booby traps” unwittingly laid by the residents they serve. A resident increases the likelihood of injury for refuse collectors by placing broken glass loose in the refuse container, filling lightweight trash cans with chunks of concrete or other heavy objects, covering the outside of a heavy object with paper or other trash, or leaving a garden hose or other object strewn along the pathway to a rubbish can. A resident who continues to use a container that is rusted through or one with unserviceable handles also increase the risk of a job injury for the refuse collector.

9. Refuse collectors carry loads that may exceed safe limits, and they handle heavy and bulky containers or carts. Sharp edges on garbage cans and carts, metal splinters and perforations add to the potential for injury. Containers often are of makeshift construction and not designed for easy lifting.

10. The emphasis in refuse collection is on speed. This, however, may lead to a complete disregard of safety. The following types of incidents and injuries occur most often during refuse collection:

- Incidents: slips and falls, overexertion, being struck by blades or motor vehicles, falling objects, flying objects, animal and insect attacks and exposure to extreme temperatures
- Injuries: strains, sprains, back injuries, cuts, amputations, bruises, lacerations, fractures and eye injuries

11. Most ordinances regulate the size, type and material (metal or plastic) of containers and specify suitable handles and configurations. The guiding principle should be the weight and bulk that an average person can lift safely. Many municipalities specify the use of tapered containers made of galvanized steel. Some are changing to the use of a rollout plastic container. Others have set up their own ordinances so they virtually rule out any other material for containers except that specified. In some areas, disposable paper and plastic bags are used as well as plastic containers.

12. Some organizations use a large “carry barrel,” made of plastic or aluminum, to transport the refuse from the rear of the house to the trucks. This eliminates the need to carry the containers to the collection vehicle. Some procedures include the use of do-wheel hand trucks with rubber tires. In other cases, the collector carries the load to the truck.

Avoidance of hazards

13. Some of the causes of human failure include insufficient rest, poor physical condition, personal problems resulting in lack of proper attention to the job, daydreaming, faulty observation, negligent attitude and chance taking. Many incidents result from workers’ attempts to salvage articles from a hopper after the packing motion has begun. Salvaging refuse from collection trucks should be forbidden. Chance taking, such as an attempt to push materials into the hopper by hand or foot while the blade is descending, also should be prohibited.

14. Before trying to lift containers, workers should tilt them to check their weight. Whenever necessary, they should get help to lift a container.

15. When collecting on private property, use only approved walks or routes. If containers are not placed in the proper location for pickup, notify the supervisor. Backyard carry-outs invite dog
bites. When this possibility exists, use a good dog repellent. (Training classes on how to understand and control dogs have been successful in some areas.)

16. Street loading should take place during non-peak traffic hours, giving the collector freedom of movement on the streets where refuse is collected.

17. Ride the truck between stops only on the steps provided. Sturdy riding steps and handholds are necessary. Keep arms, limbs, shovels and carry-barrels within the body lines of the vehicle and away from the packing mechanisms.

18. Collectors should not jump on or off moving vehicles during collection. Although the practice of boarding or dismounting from moving trucks is widespread, it is exceedingly dangerous and is condemned by safety personnel. Trucks should be halted when employees are boarding or getting off. Collectors should exercise extreme care when dismounting from a vehicle onto loose or slippery surfaces.

19. Signals to the driver should be visible and clearly understood, and all back-up operations standardized. The driver should always keep the loader in view while backing up the vehicle. Certain municipal regulations concerning back-up operations state, “No backing without someone watching and signaling to the driver.” This statement should be appropriately posted on all vehicles. Backup warning devices also must be operative on all trucks.

20. When dumping loads, loaders should stand clear while emptying truck beds. They should use rakes for this purpose. Shovel-out trucks for refuse service are a makeshift operation and should be discouraged. In hydraulically operated self-dumping trucks, the operator should avoid using erratic or jerky movements of the trucks while the body is in the dumping position and the hopper is raised. Such movements cause severe strains and possible breakage at the pivot joints. They also may cause the vehicle to overturn.

21. Floor chains should be required whenever and wherever hydraulic operated selfdumping trucks are used. There should be no loosening of turn-buckles en route to the dump areas or while on the collection route. This causes undue strain on the turnbuckle and pivot point, and it may cause the tailgate to open prematurely and injure an employee standing nearby.

Training

22. An analysis of incidents shows that “human nature” is responsible for more incidents and injuries than are purely mechanical causes. This conclusion is explained by the fact that collectors are often drawn from the most unskilled segment of the work force, have little or no experience with heavy equipment, and receive little or no training and supervision.

23. Therefore, the organization should provide a training program for new employees and refresher courses for employees required to operate new equipment. Some training programs use audio-visual aids, such as a slide presentation. Such a presentation can be of great value in explaining what hazards are inherent to a job and how they occur.

24. Some cities provide their sanitation vehicle operators with extensive training that covers driving in heavy traffic, tight areas and unusual weather conditions.

25. Collectors should be trained in proper lifting techniques and in the handling of all containers (plastic, aluminum, steel, etc.) used for backyard carry-out service. To avoid injuries, collectors should not carry containers to the truck faster than is safe. This is particularly true where collectors must use stairs or uneven walkways.
26. Moving mechanical parts on automatic, packer-type compaction units are potentially hazardous and could cause amputation or other severe injury. Training should instruct sanitation workers to activate the packing cycle using their left hand, which requires them to stand away from the open hopper. This method of operation protects the worker from material that may fly out of the hopper.

27. To prevent injuries while riding on or driving a refuse truck, workers should be taught the proper way to grip a handhold on the truck. Also, they should be cautioned to watch out for low-hanging wires and tree limbs while standing on the steps of the truck. All employees should be encouraged to ride in the truck whenever possible.

Health provisions

28. Arrange for crews to use restrooms and washing facilities at service stations along the route, at the collection site and particularly before the lunch period. Provide locker facilities for collectors’ lunchboxes, raincoats and protective equipment. Portable water should be available at the disposal site, along with sealed containers and paper cups (unless, of course, running water is available). Employees should be encouraged to shower and change into clean clothing before they leave for home.

29. Flu shots, as well as other immunizations and inoculations, if desired, are economically feasible and should be considered for a complete health program.

Personal protective equipment

30. Refuse collectors frequently handle sharp or jagged objects in the course of their work. To minimize the likelihood of cuts, they should wear heavy work gloves. A cotton, latex-covered (full dip) glove with a rough gripping area is most acceptable for use. Also acceptable are leather or canvas gloves with leather palms.

31. Workers should wear safety shoes or high-top boots with safety toes and nonskid, puncture-resistant soles. No tennis shoes should be permitted.

32. Rubber shoulder pads and hip pads will prevent bruises or cuts from edges of metal containers.

33. When handling loose or dusty materials and liquids, workers should wear approved respirators.

34. Employees wearing prescription eye glasses should be required to have safetytype prescription lenses fitted to safety frames. Safety glasses with side shields, secured with a strap, or goggles and a bump cap are suggested. Safety glasses reduce exposure to flying objects.

35. To be seen, workers should wear reflective vests.

36. Except during the summer months, workers should wear long-sleeved shirts, sturdy work clothes and jackets or sweaters. These garments will retain body heat and prevent possible muscle strains. Raincoats and non-slip safety boots should be worn during inclement weather. Workers should be forbidden from wearing tank tops at any time.

Equipment features

37. Refuse collection trucks usually include a cab where one, two or three workers may ride; in some, there may be room for a crew of up to five. A well-rounded step of serrated metal, or one coated with adhesive material with a handhold and safety rail, should be provided on each side of the body and at the rear for collectors to ride between loading points. The handhold should be located in a position where the worker can step on the step and balance against inconsistent truck movements. This will eliminate a potential hazard where trucks are required to operate in tight places.

38. Equipment used in refuse collection is often designed for a maximum payload with too little
regard to safety. Consequently, many cities are using specifications under which manufacturers are required to provide safety features. Often these features become standard equipment.

39. Ensure that the type of equipment selected is the best suited for local condition. Consider the following equipment features: capacity size, loading height, loading speed, compaction, loading devices, and water-tightness. Other criteria should include maneuverability, crew size, number of pick-ups per mile, nature of refuse accepted, and the terrain over which the vehicle is to operate.

40. The following mechanical features are important:
   • Air brakes and power steering
   • Engine powerful enough to pull steep grades
   • Anti-carburetor overloading device
   • Hopper designed to prevent refuse from falling onto the roadway
   • Protection at pinch points and shear points

Vehicle inspection

41. A pre-trip inspection is required under the Commercial Motor Vehicle Safety Act of 1986. The driver is responsible for checking that the vehicle is safe for driving on the roadway (Figure 1).

Preventative maintenance

42. Preventive maintenance, as the name implies, is the means of detecting and correcting incipient causes of equipment casualties before they occur, along with the precautions and actions constantly taken to maintain satisfactory day-by-day operating conditions of the equipment. Truck maintenance should include bleeding off moisture collected in the air tank (to prevent brake failure) and keeping windshields clean and signal lights in operating condition at all times.

43. Qualified personnel should establish and maintain a preventive maintenance program. The program should include the following tasks:
   • Comprehensive testing and cleaning of the hydraulic system
   • Replacement of critical parts at regular intervals
   • Cleaning, checking, and adjustment of the electrical controls at defined intervals
   • Checking the wire systems for wear, loose connections, bare wires, etc.
   • Checking the condition of the loading parts, body and hopper
   • Regular lubrication at definite intervals
   • Checking and repair of the vehicle where doing so affects its proper functioning

Refuse collection vehicles

44. There are several types of refuse collection vehicles:
   • Open truck
   • Enclosed noncompactor truck
   • Enclosed compactor truck
   • Prentice loader
   • Other equipment and collection systems

Open truck

45. The open truck is being rapidly displaced by other vehicles that are more sanitary for refuse collection. The unsightly appearance of the open-type vehicles, coupled with losses to scattered refuse, overturned loads, and extra effort in loading and stowing makes the use of open trucks uneconomical relative to other types of equipment.

Enclosed noncompactor truck

46. The enclosed noncompactor truck completely encloses the refuse material, except when the side doors are open for loading. Refuse may be loaded by means of a hydraulic hoist from the front or rear, or workers may load refuse manually from the side.

Enclosed compactor truck

47. The enclosed compactor truck is the most widely used. Mechanical devices load the refuse into the
**Figure 1.** A vehicle pre-trip inspection list, such as this one, can assist the operator in ensuring the safety of the vehicle. (Courtesy City of Milwaukee-Sanitation Division.)
main compartment and compress the refuse, then eject it into the rear. In some batch-type vehicles, the packing mechanism may “double cycle.” When the packer-blade (double cycle mechanism) is actuated, by the same truck motor, the gear shift of the truck’s automatic transmission should be placed in neutral. In some instances, the packing operations have accelerated the motor, and the truck has moved off. Be careful to keep this from happening.

48. Several types of compactor trucks are currently used.

49. Escalator-conveyor loader. A continuous conveyor elevates refuse into the enclosed body. Sprockets and caps are exposed during the continuous travel of the chainlike conveyor. This critical moving machinery is extremely close to the point of operation and creates a hazard. Some vehicles have a safety bar across the hopper to prevent the container or laborer’s hands from being caught in the exposed mechanism. Refuse is dumped into a lower hopper at the rear of the truck. A moving conveyor carries the refuse to the roof and toward the front of the truck, then deposits it into the main compartment. Collectors actuate levers and controls near the loading hopper, with power obtained from a take-off located under the vehicle.

50. Trough or bucket loader. Refuse is dumped into a half-cubic yard trough that is at low loading height and suspended at the rear or side of the body. When filled, the trough is raised and dumped into an opening at the top of the truck. Some trucks have side doors for bulky items, while others have internal compacting devices. The platform buckets are about three feet from the ground, making it easier for the collector to load.

51. Rotary blade type. This equipment is extremely dangerous, because there is direct power and no release. The rotating blade is very close to the worker, which poses a critical hazard. This unit can be modified so unless the operator deliberately depresses the control lever, the blade will stop about four inches from the hopper, allowing the employee to remove his or her hand before resetting the blade into action by depressing the control lever a second time. Gravity causes the blade to fall, thereby creating another source of injury. An additional serious problem in this type of vehicle is double-cycling. This occurs when the packing mechanism is actuated and the blades complete one cycle. The packing mechanism continues operating through a second cycle without the operator touching the control. This is quite common when the vehicle is nearly loaded.

52. The batch loader. This equipment consists of a rear-end loader in which the slope of the blade is designed to provide an upward packing action. This type loads and consolidates in one operation. Refuse is dumped into a hopper approximately 30 inches above the pavement. Many of the vehicles now use an auxiliary engine to improve safety operations. The blade, which follows guide rails in a sweeping motion within the hopper, pushes the refuse from the hopper into a 13-25 cubic yard truck body. Before it makes the forward packing motion, the edge of the blade sinks flush against the body frame. Sometimes this will catch the operator’s fingers or hand. The blade will sever objects protruding over the hopper’s edge during its downward travel. The blade may be equipped with two-stop operating controls, so the blade stops halfway through its motion and the controls must be actuated again to complete the cycle. Equipment of this type must have manual or automatic controls to prevent hazardous double-cycling, which can occur when the unit is nearly loaded. When dumping, the hopper is raised hydraulically from the truck body, and the vehicle is driven forward, permitting the refuse to fall to the ground by its own weight, as the refuse is ejected hydraulically from the rear of the load tank.

53. In the interest of safety, all new batch loaders equipped with the 12-second cycle must include a two-stop operating control. Each refuse collec-
tion vehicle must come equipped with a four-way emergency flasher system. All vehicles also must have operating backup alarms.

54. Personnel should understand the operation of power equipment on the truck. Make them aware of the injury potential before they operate it. Workers should learn the location of all stop buttons and emergency levers. They should keep their hands clear of blades and other hazardous areas.

55. Instruct collectors to stand clear of the truck body and the hopper when the motor that operates the packing mechanism is operating, regardless of whether the mechanism is driven by the truck motor or an auxiliary motor.

56. All crew members should be trained in the proper way to operate the packing mechanism. The controls should be located at the rear corner of the truck where the operator has a full view of the blade. While operating the packing mechanism, the employee should be on the side of the truck, using the left hand and facing the front of the truck. The operator of the packing mechanism control should ensure no one is behind the vehicle as it is going through the cycle.

57. To prevent material under compaction from ejecting to the sides where a worker or a driver may be standing, a shield should be provided during the unloading operation at the disposal site. Workers standing by the sides of units must be wearing safety glasses at all times.

58. Packer-loader. Because many incidents involve packer-loader refuse trucks, a safety gate can provide the mechanical safeguard that will protect employees from direct contact with moving parts. A specially-designed safety gate has been developed for the packer-loader type mechanism. With a simple control, the safety gate is released to an “up” position, which keeps the worker away from the blade. This part of the operation is spring-loaded and calls for minimum effort on the part of the operator. The blade descends only when the gate is up and the hopper is loaded by a downward movement of a control lever. Safety gates have been successfully installed on some packer-type units and are relatively simple to operate.

59. Such a device consists of a gate one foot, four inches by six foot 11 inches that has been installed over the loading area or platform. The gate is made of an angle-iron frame covered with expanded metal. The gate is lightweight and affords a view of the packing blade while it is in motion.

60. Hydraulic hopper. Another type of packer-loader is the hydraulic hopper, which places refuse in a one to two cubic yard hopper. An auxiliary engine raises the hopper hydraulically. A packer blade then sweeps the refuse into a 25 cubic yard against an ejector panel. Dumping is achieved by raising the hopper hydraulically and actuating the ejector panel, which forces the refuse out of the truck. The body need not be raised.

61. Movable bulkhead loader. The body of this loader may be square or round in transverse section, with loading through openings in each side, near the front. A hydraulically-operated plate moves refuse from the front to the rear, filling and compacting at the same time. Ejection is accomplished by opening the rear of the body and moving the plate to the rear.

62. Right-hand drive chassis with steps. Trucks are available with right-hand-drive chassis and steps, which allow the driver to work with the collectors.

63. One type is a low-entry cab with a 20-25 cubic yard packer on the frame with dual steering wheels and the hopper in the rear.

64. Another type is a side-loader on the low-entry cab with the hopper between the cab and packer body.
65. Another type contains a hydraulically actuated compactor plate, which compresses the refuse from a one cubic yard hopper into a detachable body of four to six cubic yards with a force of 30,000 pounds. The filled container is brought to a centralized collection point and replaced with an empty container. A front-end loader then loads the contents of these containers into a 21-30 cubic yard “mother truck.”

Prentice loaders

66. A prentice loader is a fully hydraulically system that reduces the aspect of lifting items and large brush piles in the solid waste field. Workers can load items on the bed of a prentice loader, or the prentice loaders can be used with rolloff trucks. (However, if the roll-off truck is used, watch out for clearance of wires, trees and buildings.)

Other equipment and collection systems

67. Roll-off truck with roll-off dumpster. Some municipalities are starting to use rolloff trucks with a roll-off dumpster on the back. They can be used in four ways:

- As a self-help station in the district yards, where the residents can bring extra garbage and bulky items direct to the dumpster

- As a self-help station placed on city streets for block cleanup, allowing residents to place items in the dumpster

- Placed on the street for power brooms to dump street sweepings into

- With a prentice loader for brush and large items removal

68. Wider use of dumpsters. Many municipalities are using more dumpster containers for large apartment and business accounts. Dumpsters come in many sizes, from 2-8 cubic yards.

69. There are two ways to pick up the dumpsters. One is to use a rear-loader enclosed compactor. The other is to use a front-loader enclosed compactor truck.

70. Some of these trucks have certain hazardous features. For example, on the frontloader trucks, the loader arms come past the cab and can sever an arm. A safer design has U-shaped arms that do not pass the driver’s window. Another design is one in which the windows are prevented from opening fully, and interlock is installed to prevent the arms from operating when the doors are open. On the rear-loader dumpster, the use of chains is a problem. They may break and drop the dumpster. Some trucks are now using a hydraulic lift bar that picks up the dumpster from the bottom.

71. Small 4 x 4 drive truck. Another method for refuse pickup is to use a small 4 x 4 (4.8 x 4.8 dm) drive truck. These pull three large boxes on wheels, thus forming a “train.” A mother truck with a capacity of 20-24 cu yd (15-18 m³) removes the contents of these trains to the disposal site while the crew and the trains are engaged in collection.

72. When moving on thoroughfares, drive these trains no faster than 25-30 mph (43-48 kph), because they may whip at higher speeds. Also drive these trains with extreme care on hills and under icy conditions.

73. Front-end loaders. Also used are 50 cu yd (38.2 m³) front-end loading collection trucks (front-end loaders), serviced by diminutive scooters. Collection crews consist of a truck driver, two motorized scooter operators, and generally a third crew worker who uses a hand-wheeled metallic container with a capacity of 1/2 cu yd (0.382 m³) to collect refuse from locations inaccessible to the scooters.

74. The procedure begins when a giant packer pulls into a city block and parks. The collectors drive
their scooters up driveways and can service up to three homes before returning to the truck. They dump their refuse from their 1 1/3 cu yd (0.194 m³) hydraulically operated containers into the three cubic yard (2.3 cu meter) collection truck hopper, which has been lowered to the ground in front of the truck. The driver then raises this hopper over the cab to drop the load into the truck box. Shields on either side enclose the debris and prevent it from scattering. After scooters have dumped their load, packer-rams compact each load, and the truck is moved to the next block.

75. The introduction of scooters instead of using large trucks with a capacity of 50 cu yd (38 m³), has reduced the incidence of back injuries and complaints of worker fatigue.

76. Roll-out cart system. Many municipalities are now using the roll-out cart system. The cart system has one driver-loader, whose job it is to drive the truck and dump the carts into the truck. The second worker on the job also dumps carts and helps the driver-loader in backing up the truck. The packer that is used has two hydraulically operated flippers on the hack back of the truck to dump the cart into the hopper.

Special lights and reflectorized signs

77. The lights and signs may be installed parallel to the ground on the tailgate of the refuse collection truck. The center line of the light should be six feet, six inches above the stand platform. The light and signs may be attached to a separate piece of two-inch angle iron extending the full width of the body. The lights are to work in unison with all other lights. The turn signals should be located with the center line of the light 5/2-inch from the outside of the body and the lens not less than four inches from the chassis. The stop lights should be located with the center line of the light 15 inches from the outside of the bed and the lens not less than seven inches from the chassis.

78. A caution sign, one foot by three feet, should be centered between the stop lights and should be placed on a sheet of aluminum and reflectorized with an alternate two-inch red and two-inch white diagonal line. The word “caution” should be in letters four inches high and centered on the sign.

79. Follow local and state vehicle codes for lighting.

Driver responsibility

80. The actions of the driver greatly affect the safety of the crew. In some cases the driver is the crew leader. Therefore, the way the individual drivers perform their duties determines the safety of the crew and mobility of the vehicle. The driver should be dependable, alert, sober, steady and ambitious. He or she needs good judgment and a good mechanical aptitude. The driver should be taught safety rules and follow them at all times.

81. When the driver backs the truck, a crew member should direct him or her. The safety of individuals depending upon the condition and proper use or controls, so correct usage is mandatory.

82. An unsafe practice among some packer-loader drivers is to drive over cardboard or wooden boxes, thereby flattening them to facilitate loading into a hopper. However, children like to play with and hide inside cardboard or wooden boxes, so the practice of a packer-loader truck crushing empty boxes should be prohibited. At the same time, local newspapers should instruct citizens to break down cardboard and wooden boxes before placing them in trash areas for disposal. Children have suffered injury and death because this procedure had been neglected.

Sources of information

National Safety Council, 1121 Spring Lake Drive, Itasca, IL 60143. Injury Facts