

# Solid Waste Management in Wholesale Food Distribution Centers

Presented by ROBERT P. Stearns

*Discusses the amount of solid wastes generated by wholesale food distribution centers, methods and cost of existing waste disposal systems and recommendations for improvements.*

ROBERT P. STEARNS is Vice President of SCS Engineers. Mr. Stearns is a registered professional engineer in the State of California. He was employed as a sanitary engineer for the Bureau of Sanitation City of Los Angeles for 7 years. He joined Ralph Stone & Co., Inc., in 1967 as project manager and was elected a member of the Board of Directors. Mr. Stearns and two other engineers founded SCS Engineers in 1970. He has directed a number of projects dealing with solid waste management.

Wholesale food distribution centers help provide for economical and orderly distribution of farm products to the consumer. Their location in urbanized areas, however, has brought their waste disposal practices under the close scrutiny of local regulatory agencies. Recent concern with the environment in nearly every area of the country is limiting the choice of disposal methods while forcing some centers to improve their existing waste disposal system.

Six food distribution centers were selected by the U.S. Department of Agriculture—Marketing Facilities and Development Branch for intensive study by our firm. The purpose of the study was to gather information on solid wastes generated; to determine the cost-effectiveness of disposal methods in use; and to record descriptive information on center operations and problems associated with present disposal methods. Based on this information, recommendations for applicable waste disposal methods were to be formulated.

A report describing the results of the study and including recommendations was submitted to the U.S. Department of Agriculture in June of 1971. The report can assist center management in selecting a cost-effective solid waste management system and provides base-line information on quantities and types of solid waste produced in these establishments. The latter information can aid local public works officials and solid waste collection contractors in assessing their respective roles in center waste management.

## *Description and Comparison of Food Distribution Centers*

Descriptive information for the six centers is contained in Table 1. Of the six centers visited by the project team, four were privately owned, one state owned, and one municipally owned. The centers ranged in size from 22 to 146 acres including buildings, paved areas and railroad track sidings. Tenant stalls at all centers were approximately the same size (2,500 sq ft); there were as many as 254 stalls at the largest center. Tenants often operated from several stalls depending on volume and type of commodity distributed.

Fresh fruits and vegetables were the predominant food commodity distributed. For purposes of the survey, food quantities distributed were measured by weight (tons) rather than the more common carlot equivalent used by the food industry. Although the weight per unit volume of various foods will vary widely, field data indicated

Table 1. Descriptive Information on Food Distribution Centers Surveyed

Center	Location (state)	Year opened	Ownership	Total area (acres)	Number of stalls	Area per stall including platforms (sq ft)	Number of tenants
1	Texas	1951	Private	36	84	2,250	34
2	California	1962	Private	16	84	2,200	15
3	New York	1967	Municipal	116	252	2,500	110
4	Massachusetts	1968	Private	37	130	2,400	51
5	Kentucky	1955	Private	22	50	2,750	14
6	Georgia	1959	State	146	254	2,250	51

that on the average, 19 tons of food was contained in each carlot equivalent. Food quantities received in the year 1970 at the six centers varied from 95,000 tons at the smallest center to over 1,170,000 tons at the largest center.

Common solid wastes included culled or spoiled produce, food trimmings, paper, cardboard, wood, and other packing material. The quantity of solid waste generated per ton of food distributed averaged 20 lbs or 1 percent by weight and ranged from a low of 14 lbs at one center to a high of 36 lbs at another center.

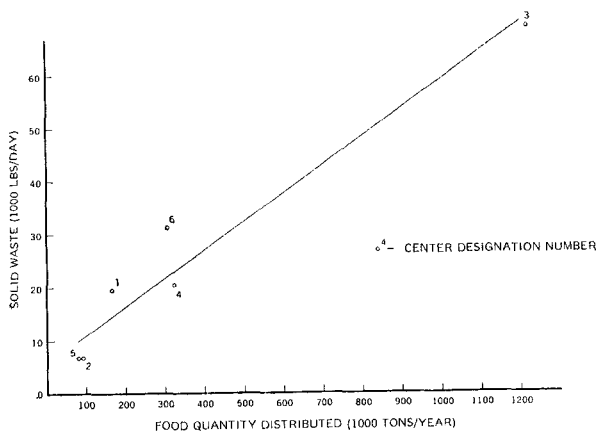


FIGURE 1

Figure 1 graphically depicts the relationship between the quantity of food distributed and the total quantity of solid waste produced as determined from the surveys.

Table 2 identifies waste types and provides representative density figures for the wastes found at the centers.

Table 2. Solid Waste Characteristics

Waste type and category	Average density in loose condition (lbs/cu yd)	Range in average density (lbs/cu yd)	
		High	Low
<b>Food</b>			
Spoiled	685	950	400
Scraps	685	950	400
<b>Non-food</b>			
Corrugated	75	200	50
Wood	200	350	150
Paper	150	200	100

### Present Waste Management Methods and Associated Problems

Several methods were used to dispose of solid wastes from the centers surveyed. Methods used resulted primarily from the type of ownership, the importance of sanitation to the manager, and local regulations governing waste handling and disposal. The age and physical condition of the grounds and buildings and the degree of cooperation afforded to managers by tenants were also factors.

At the cleaner centers, the conditions reflected tenant acceptance of the need for proper waste containerization and regular collection service. The manager also expressed concern for sanitation and enforced rules governing waste management at these centers.

At all centers surveyed, the tenants had responsibility for maintaining their own stalls in a clean and sanitary

fashion. In nearly every case, the stalls were adequately cleaned on a daily basis. However, conditions outside the tenant stalls reflected less concern and as a result were often heavily littered with wood, cardboard, paper and rotting produce.

Crowded conditions in truck loading and unloading areas often made waste collection operations difficult. At one center, tenants were permitted to sweep stall wastes off the loading docks onto the ground. Spoiled and culled produce at this center were placed in cardboard boxes by the tenants for pickup by local hog farmers. However, significant amounts of these highly putrescible materials also were found on the ground.

Waste storage containers were used at the remaining centers and some form of routine collection service provided by either the local municipal collection agency, a private contractor, or center personnel. A combination of service was frequently provided, with the private contractor, municipal collection agency, and center personnel each responsible for some aspect of waste disposal. For example, at one center a private contractor collected wastes from tenants while municipal crews cleaned the paved areas of the center. Center personnel were responsible for cleaning the railroad track areas. Even at those centers receiving regular collection service, a considerable quantity of waste material accumulated daily in the truck and railway car unloading areas.

Problems with waste disposal were due to several reasons. Primary among these were the lack of proper waste storage containers and infrequent collection service. This resulted in overflowing containers and waste spillage onto loading docks and paved areas. Wind and traffic often carried the waste to other locations on the center property.

Disinterest and/or inactivity of both managers and tenants was another factor contributing to litter. The lack of clear-cut lines of responsibility for solid waste management was a problem at most centers.

Waste accumulated in the house and team track areas. These areas were difficult to clean because of parked rail cars or poor or non-existent paving. In most cases shipping and packing wastes in the railroad car were swept out of the car onto the ground.

Cleaning of streets and other areas was the responsibility of either the center or the local municipality. Equipment used for cleaning included mechanical street sweepers, skip loaders, dump trucks, and hand tools. Larger waste items, such as cardboard boxes, wood pallets, and other similar material could not be picked up by conventional means and costly hand labor was often required.

Final disposal point for most of the waste was the landfill. At one center, a small incinerator was operated for disposal of cardboard cartons. A larger modern incinerator had been abandoned as uneconomical at another center. Existing incinerators at other centers had been closed by local air pollution control agencies.

Grinding food wastes for disposal to the sewer was used by some tenants processing or packing produce. For occasional large quantities of unsaleable produce, centers disposed of the material at landfill or distributed it to charitable organizations.

Costs of existing waste management, including collection, disposal and administration, varied from \$7 to \$41 per ton of solid waste removed with the average for the six centers being \$25 per ton of waste.

### Development of A Waste Management System

The basic components of a waste management system include the storage container, collection procedure, waste

transport to the disposal site, and final disposal. Street and paved area cleaning is also a part of the system. Final disposal may be an incinerator, landfill, or other method.

**Waste Storage Containers.** Containers are needed to properly store waste until collection and should be located near the point of waste generation, i.e., the individual tenant's stall, center restaurant, or administrative office. Container needs are based on the volume of waste generated, the collection frequency, and the type of collection method used. Each tenant should have adequate storage capacity for wastes generated between days of collection.

Quantities and types of solid waste material generated by tenants will vary. During the field survey, the weekly volume of waste ranged from less than 1 to over 4 cu yds per stall. Because of this variation, a survey of quantities generated by each tenant is necessary to determine container needs. Container types and sizes should be uniform in the center. This facilitates collection in an efficient manner.

Due to the organic nature of some center wastes, and the waste volumes generated, containers should be emptied at least twice each week. Containers recommended for use by tenants include salvaged 55 gallon drums or metal bins, with the latter preferred. Metal bins are available in capacities of from  $\frac{1}{2}$  to 8 cu yds and range in cost from \$90 to \$700 each.

For storage of solid waste from several tenants, a larger container or use of a stationary compactor is recommended.

The stationary compactor is designed for use when large volumes of solid waste are produced. When centrally located at the center, preferably immediately adjacent to a loading dock, it is available for use by tenants whenever needed.

The compactor consists of a charge box and hopper opening into which waste is deposited. A hydraulically operated ram pushes the waste through an opening into an attached container. The waste is compressed and completely enclosed in the compaction container thereby reducing waste volume by one-third or more and minimizing fly and odor problems. The enclosed container prevents scavenging of discarded produce by unauthorized persons. When the container is full, it is detached from the compactor and hauled to the disposal site.

The stationary compactor can accept all types of waste generated at a center, including wood pallets. In most localities stationary compactors may be leased from distributors or from private collection contractors. Installation costs, not including the compactor, average about \$3000. For a five-year lease, compactors generally cost from \$500/yr for a 35 cu yd per hr size to \$1250/yr for a 100 cu yd per hr model. Periodic dumping of the container is not included in this costs.

**Collection and Transportation** The volume of waste produced by the tenants, the number of containers to be serviced daily, and the transport distance in large part determine the requirements for collection vehicles. In general, as haul distances increase, so should the capacity of the collection vehicle.

Figure 1 is useful in determining anticipated total volume of solid waste, based on quantity of food distributed. Conversion of weights to cu yds can be made using average density values presented in Table 2. However, verification of derived values for a particular center is recommended.

Small 3-wheeled collection vehicles can be used to transport wastes from tenant containers to a stationary compactor, or to a center incinerator. These units have capacities ranging from 1-3 cu yds and cost from \$2500-\$7000 each. Tenant storage containers should be 55 gal

drums when this method of collection is used.

Larger compaction trucks capable of collecting and transporting wastes from many tenants to a distant disposal site are available in capacities up to 40 cu yds. They range in cost from \$8,500 to \$40,000. These units are commonly used by private collection contractors and municipal agencies engaged in waste disposal service. Some are equipped with devices for mechanically loading large waste storage bins.

**Alternative Disposal Methods.** There are several methods of disposal suitable for wastes originating from a food distribution center. An incinerator may be economical for disposing of wood pallets, cardboard cartons, waste paper, and other combustible wastes if landfills are located at long-haul distances from the center. However, center food wastes are difficult to burn and incineration of this material is impractical unless the combustible materials can be properly mixed with the food waste prior to incineration. Problems in meeting local air quality regulations may arise. Since incinerators have high purchase and operating costs, careful economic analysis should precede any proposed installation.

All center wastes can be readily disposed by the sanitary landfill method. This method involves compacting and covering the waste with earth to preclude environmental nuisances. Sanitary landfill is less expensive than incineration provided a landfill site is available within a reasonable haul distance of the center.

Garbage grinders can be used by those tenants processing food. The grinder can be placed in the process line to grind material directly to the sanitary sewer. Larger grinders operated by the center for tenant use may be feasible. Grinding of food wastes to the sanitary sewer is prohibited in some locations.

Food type wastes can be fed to hogs. Restrictions by local health authorities may effectively preclude the use of this method, however. The seasonal variation in hog feed requirements may not coincide with the center-generation of food type wastes and separation of food waste from non-edible waste would be required. Control of collection is difficult.

Salvage of wood pallets and cardboard may be possible depending on local market conditions for these items.

### **Recommended Waste Management System**

The manager of the center should have responsibility for waste management. As a part of this responsibility, he should be authorized to administrate all waste collection and disposal services provided tenants, to contract with private firms for services, or to establish center capability in terms of labor and equipment to provide for waste disposal as required.

Each tenant of the center should be provided with and be required to use the proper number and type of waste storage containers based on the volume of waste generated. Tenant containers should be uniform in size and design throughout the center and be serviced a minimum of twice each week. Tenants generating larger volumes of waste would use additional containers or have their containers serviced more frequently. Waste storage containers should be located as near the point of waste generation as is practical. The rear dock area is convenient for tenant use and for collection service accessibility.

Collection of waste from elevated and street level rear dock areas can be made using a front-end loading packer vehicle. Waste containers used when collections are made from the dock should be of the metal bin type equipped with casters and lift handles to facilitate use by tenants and mechanical loading.

Because of high costs and increasingly stringent air pollution control regulations, the installation of an incinerator for disposal of center wastes is not recommended. Nearby municipal or privately operated sanitary landfill sites can provide economical disposal for center wastes. Several storage containers of 4 to 6 cu yd capacity should be located on the center premises and truckers encouraged to dispose of packing wastes into these containers. These containers can be used for railway car packing wastes also.

Hog feeding of center food wastes should not be considered a reliable, longterm waste disposal method. If hog feeding is considered, local regulatory agencies having jurisdiction over feeding of garbage to animals should be consulted. In addition, center management must establish rules under which the hog farmer will operate to insure uninterrupted food waste removal in a sanitary manner. Tenants processing or preparing produce for packaging and center restaurants should be encourage or required, local regulations permitting, to install a garbage for disposal of food wastes directly to the sewer system. Installation of these units during new center construction is strongly recommended.

The streets and other paved areas of the center should be swept at least twice weekly using a mechanical street sweeper. To facilitate this cleaning activity, all trucks and piggy-back trailers should be parked away from the dock on designated days (during night sweeping hours). A skip-loader or hand labor can be used to remove items

too large for pick-up by the sweeper. Unpaved railroad track areas should be paved to facilitate the used of efficient mechanical street cleaning methods.

When a suitable location exists at the center, the installation of a stationary compactor should be considered by market management. Use of a pickup truck or small three-wheeled collection vehicle can be used for transporting tenant wastes to the compactor if the compactor cannot be located readily accessible to the tenants. In general, only the largest centers (receiving at least 1,000 tons of produce daily) should consider the purchase of equipment and the hiring of labor to provide waste disposal service for tenants. Others, particularly those privately owned, should contract with a competent private hauler for the required service. Municipally owned centers may have access to municipal waste collection service. If the center wishes to evaluate establishing its own waste disposal operation, or the installation of a stationary compactor a careful planning and evaluation period is recommended. An engineer experienced in solid waste management should be retained to evaluate center conditions and recommend equipment and other system components. Service cost estimates submitted by local qualified private haulers should be included in the evaluation process. Specifications governing the services to be provided by the private hauler are recommended. Competent technical and legal advise is needed to prepare the specification.

---

#### **ACKNOWLEDGEMENT**

This work upon which this publication was based was performed pursuant to Contract No. 12-14-100-10322 (52) with the U.S. Department of Agriculture.