

# SOLID WASTE MANAGEMENT



**NEW  
DIRECTOR'S  
GUIDE**

This guide was prepared by APWA's Solid Waste Management Committee. For more information on the committee [click here](#) to visit the committee's webpage.



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# INTRODUCTION

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Solid Waste Collections is a transportation service and logistics industry. The method of collection and the equipment chosen to provide those services impacts the costs to provide those services. It is an industry best practice to ensure the selection of equipment purchased is a partnership between the business unit responsible for providing the services and the fleet managers responsible for maintaining the equipment. As Public Works Director, it is critical to ensure solid waste fleet assets are adequately funded for proper maintenance and end-of-life replacement. Truck assets for a solid waste utility are like water pipelines for a water utility, they must be dependable to preserve the level of service.

In addition to ensuring the Fleet Service group is involved in the process of specification development for equipment, it is a best practice to gather input from the operators who utilize the equipment.

Your public works department fully contracts for the collection and handling of solid waste; the responsibilities for equipment selection, performance, and maintenance should be the contractor's. In this case, performance requirements to prevent things like fluid spills, leaking trucks, litter, or unsafe/unreliable fleet problems should be addressed in the contract to protect the city from poor contractor performance.



# EQUIPMENT

## Common Equipment Types and Functions

**Rear load** – With the hopper in the rear of the vehicle, a rear loader is intended to be used as a manual or semi-automated collection vehicle. Refuse material can be thrown by hand, loaded via a secondary unit (such as an articulated loader), or fitted with a lifter or tipper to collect bins or carts.

**Front load** – Used primarily in multi-family units or commercial enterprises, these trucks load material by grabbing the bins in front of the vehicle and lifting over the cab to dump in the hopper. Front loaders can be fully automated and allow a lot of material to be collected in one lift. Also, carry cans can be used to convert the truck to an automated front loader, enabling it to be used for residential pickups.

**Side load** – Used primarily in residential curbside collection, these units can be manual, semi-automated, or fully automated depending on collection needs. Manual systems require the operator to do the lifting, a semi-automated system requires the operator to bring the cart to the lift mechanism, and fully automated systems enable the operator to stay

in the cab while the lift mechanism grabs and empties the cart.

**Roll-off** – Delivers and collects rolling dumpsters, which are typically used for bulk material loads or construction debris.

**Tipper** – Same as a rear loader with a different attachment.

**Grapple trucks** – Used to collect bulk material waste. These trucks utilize a standard truck chassis fitted with a hydraulic boom and grapple or clam shell bucket and a dump body or trailer.

**RAT system** – Rear loader, Articulated loader and Trailer (RAT), used for bulk material collection. The articulated loaders are highly maneuverable because the midpoint articulation allows for both street and alley collection. Articulated loaders lift the bulk material and deposit into the rear load hopper for transport to the transfer station or landfill.

**Doubles** (star type systems) – No longer manufactured; Heil stopped making them in 2017 or 2018.



# EQUIPMENT

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## Considerations When Selecting Equipment

- Safety for the public and the operator
- Local, state, and federal regulations (i.e. bridge weight)
- Type of container being serviced or if trash is bagged/requires manual handling
- Type of material (bulk, contained, HHW, other specialty)
- Service location (alley, curb, compactor)
- Road conditions (road width, tight turns)
- Other special service conditions
- Facility where the material will be dumped



## Other Equipment Specification Decisions

- Safety features
- Payload
- Chassis (including right or left-hand drive)
- Body (including load discharge)
- Fuel type and fuel capacity needs
- Cab and comfort features
- Technology
- Gripper arm
- Serviceability
- Warranty
- Training for operators and technicians
- Full life cycle value of the equipment (Total cost of ownership)

# SAFETY

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Solid waste collection and handling is identified by the federal government as one of the ten most dangerous professions in North America. The task of solid waste collection is a major contributor to those safety rankings and poses significant risk to your employees and the public at large.

As Public Works Director, you have the important responsibility of developing a culture of safety in your organization. Building a culture of safety starts with foundational building blocks and grows to include many factors that require effective employee engagement. It is also critical to recognize that this responsibility is to both your employees and the community at large, as the work of solid waste professionals can be a risk to the community based upon the equipment operated and the hazards of the waste we manage.



## Organizational Safety Policies and Personnel

An organizational statement with a commitment to safety often from the city/town manager or public works director is a great place to start.

Department policies to address legally required programs such as seat belt usage, personal protective equipment (PPE), eye and face protection, protective footwear, noise exposure (hearing conservation), fire safety, hazard communication, blood borne pathogens, and lock-out tag-out are necessary. Organizations such as OSHA, state OSHA, and

your local jurisdiction's health department will have requirements you must address.

In the event your jurisdiction has an employee union representing the workforce, there are likely safety requirements included in the labor contracts.

It is a recommended best industry practice to have one or more safety professional(s) on staff for safety policies, performance audits, and accident investigations.

# SAFETY

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## Personal Protective Equipment

Personal Protective Equipment (PPE) is a critical requirement. A job hazard assessment is an excellent tool to identify the types of hazards each employee faces and the types of PPE necessary to provide adequate protection. It is important to ensure employees and supervisors are properly trained on the use of PPE.

Safety devices for staff and equipment beyond traditional PPE are also important and should be considered based upon your specific solid waste collection services (for example: vehicle cameras, alarms and lights, etc.).

A typical PPE program will include a policy, protective footwear, protective uniform, eye and face protection, hard hat, gloves, high visibility vest/T-shirt, hearing protection, etc. Some programs may include hepatitis shots, annual hearing examinations, and other preventative measures as options for employees at risk for such exposures.

## Commercial Driver's License and Driver Safety

A proper commercial driver's license is required for drivers to meet federal requirements. Programs must include pre-hire and random drug screening, vehicle walk around inspections and air brake testing, and regular employee physicals.

All drivers, including non-Commercial Driver's License (CDL), should be required to attend defensive driver training classes as a best practice.

A driver policy is strongly recommended for all drivers to address training driver requirements, such as rules against traffic and parking violations, distracted driving, cell phone and wireless communication use and discipline for violation of the policy.

An accident policy is also strongly recommended as a best practice. Operating a commercial garbage truck requires skill and focus. Employees with an accident history should be evaluated, retrained, and considered for reassignment or termination if unsafe practices are observed. Well-trained accident investigators with a knowledge of the equipment and tasks of garbage truck drivers should be responsible for investigating all accidents.

Driver routing is an important consideration for accident avoidance. For example, a best practice is to develop routes to avoid left hand turns, backing based on collection type, and turns requiring more than a three-point turning maneuver.

# SAFETY

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## Training

All solid waste employees should attend job-specific training prior to starting assigned work. New employees should be assigned to work with experienced staff after training.

Drivers should be given time to gain experience and familiarity with assigned routes, as possible.

## Significant OSHA Standards

1910.95 – Occupational health and environmental control, occupational noise exposure

1910.132 – Personal protective equipment, general requirements

1910.133 – Eye and face protection

1910.135 – Head protection

1910.136 – Foot protection

1910.147 – Control of hazardous energy (lockout/tagout)

1910.157 – Portable fire extinguishers

1910.1030 – Blood-borne pathogens

1910.1200 – Hazard communication

# TYPES OF MATERIALS

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Solid waste management programs deal with different types of materials. Each material should be handled and disposed of in proper ways. State law may or may not ban certain items from disposal sites and require different disposal techniques. Refer to the Environmental Protection Agency laws and state laws for any questionable items. Disposal sites will also have restrictions on acceptable materials.

Below is a quick list of the most common types of materials handled by Solid Waste divisions or departments:

**Bulk Items** – Appliances, furniture, bedding, mattresses, carpet, flooring and other similar items.

**Construction and Demolition** – Concrete, bricks, wood, asphalt, drywall, metals, glass, rigid plastics and other building components.

**Electronics** – Computers, televisions, VCRs, stereos, copiers, fax machines, cell phones, tablets, laptops, smart wearable technology, and others.

**Garbage** – Also known as municipal solid waste (MSW), consists of everyday items we use and then throw away, such as product packaging, grass clippings, furniture, clothing, bottles, food scraps, newspapers, appliances, paint and batteries. These come from homes, schools, hospitals and businesses.

**Household Hazardous Waste** – Household products that can catch fire, react or explode under certain circumstances, or that are corrosive. Paints, cleaners, oils, batteries, and pesticides are products that fall under this category as well.

**Litter garbage** – Such as plastic bags, paper, cans, and bottles left lying in an open or public place.



# TYPES OF MATERIALS

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**Medical/Biohazardous Waste** – Any waste containing infectious materials or potentially infectious substances such as blood. “Sharps” such as needles, blades, glass pipettes and other materials or items that can cause injury during handling are of high concern.

**Motor Oil (used oil)** – Any oil that has been refined from crude oil or any synthetic oil that has been used and as a result of such use is contaminated by physical or chemical impurities. Simply put, used oil is exactly what its name implies—any petroleum-based or synthetic oil that has been used. Most states ban used oil from landfills and require special disposal/recycling.

**Organics** – Typically pre-consumer food waste mixed with green waste (yard trimmings) for composting. Depending on the infrastructure and regulations, there can be post-consumer food waste (cooked foods), dairy and meats.

**Recyclables** – Materials such as paper, glass, plastic, and metals. These come in the form of cardboard; magazines; copy paper; plastic bottles; plastics #1-7, green, brown and clear glass; and aluminum or steel cans for residential collection. Commercial collection can produce larger industrial-grade materials and scrap metal.

## **Types of recyclable collection:**

**Single-stream recycling** – Recycling system in which all paper, plastics, metals, and other containers are mixed in a collection truck, instead of being sorted into separate commodities at the point of collection.

**Dual-stream** – Also known as source separated recycling. This means keeping paper and cardboard separate from containers, like glass, metal, plastic containers, and cans.

**White Goods** – Large electrical goods used domestically such as refrigerators, washing machines, and dryers (typically white in color). These items need to be free of any refrigerant or compressors before recycling or disposing.

**Yard Waste** – Shrubbery trimmings, tree trimmings, grass clippings, leaves and other outdoor vegetation.

# COLLECTIONS & CUSTOMERS

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## Types of Customers

Depending on what services are offered, the types of customers and level of service you provide or contract for will vary.

Following are the main types and brief descriptions of customers. However, your agency should have a policy document, such as an ordinance, that defines customer types.

**Residential** – Single-family dwelling units. Some agencies include some or all multifamily.

**Multifamily** – Multifamily customers are defined differently from agency to agency. Some identify multifamily customers by number of units. Example: four-plex dwelling unit and less considered residential and units above four-plex considered commercial. Other agencies consider all multifamily dwellings as residential or all multifamily dwellings as commercial.

**Commercial** – May include wholesale and retail establishments, home businesses, restaurants, shopping centers, campgrounds, churches and related establishments, hotels and motels, bunkhouses, ranger stations, crew quarters, recreational vehicle parks and day-use recreation areas, licensed child-care facilities, and all other places not classified as residential.

**Institutional** – Some agencies break out institutional customers from the commercial sector. These include schools, hospitals, retirement and nursing homes, assisted-living facilities, prisons, and government centers.

**Industrial** – Industrial customers (manufacturing, fabrication, construction sites, power and chemical plants, mining, or agriculture) may be included in commercial or called out separately.



# LEVELS OF SERVICE

There should be a policy on the type(s) of container, allowable material(s), number of containers allowed and capacity limit.

## Residential Service

Typically, collection is once a week. In some locales, it may be twice a week or every other week. Separated materials may have different collection frequencies. For example, garbage is collected once a week, recycling and organics alternating every other week.

The distinct materials collected—garbage, recycling, yard debris, and/or organics—will have unique containers. Residents may need to purchase ordinary garbage cans from the store, your agency may provide totes, carts, and/or bins, or residents may need to purchase specific collection bags or stickers.

## Commercial Service

Generally set by the needs of the customer. Service can range anywhere from one time per week to daily, but may be limited to Monday-Friday, dependent on the agency work schedule and/or disposal facility operating hours.

In addition to the types of containers used for residential collections, commercial containers may also include dumpsters, roll-offs, and compactors. Containers may be owned and rented by the agency or owned by the customer.

## Container Examples



## Container Lid Labels Examples



# LEVELS OF SERVICE

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## Collection Frequency

- Which day(s) of the week each material type is collected needs to be clearly defined for the customer.
- Customers need to be notified of schedule modifications for holidays or other events.
- Re-routing changes should be clearly communicated to customers in advance.

### Residential

Containers need to be set-out by a certain time, typically, the start time for the agency's employees. A time when the containers need to be retrieved should also be called out.

Service may require customers to place containers at the curb or alley and retrieve them after collection. Drop-off center collection requires customers to bring materials to a centralized location. Door or backyard service requires the collector to haul customer containers from the residence, empty them, and return them. Some agencies offer this service to special needs customers.

### Commercial

Access to containers needs to be available. Agency may have extra charges for activities such as opening container enclosures, unlocking containers, or moving containers for collection.

A pickup location is designated for each customer. Set-out and retrieval times need to be designated for bags or containers that are placed out in public areas. Generally, agency will have specifications and requirements for container enclosures.

# LEVELS OF SERVICE

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## Acceptable Materials

Making sure each of the different materials types collected are “clean” is never-ending. Acceptable material types should be well defined and prominently publicized. Your agency may have policy documents that mandate separation of hazardous materials, recyclable materials, yard debris, organics and/or other types of material. You should also have tools, such as Oops stickers, to inform customers when they have set out material that does not conform to your policies.

As contamination issues takes center stage, many organizations such as The Recycling Partnership ([recyclingpartnership.org](https://recyclingpartnership.org)), Recycle Across America ([recycleacrossamerica.org](https://recycleacrossamerica.org)), and Keep America Beautiful ([kab.org](https://kab.org)) offer outreach information that may be helpful to your agency.

## Routing

There are many variables to consider when developing efficient collection routes: crew size, collection vehicle type and size, container type, set-out location, collection frequency, housing density, traffic patterns, location of disposal facility, weather, and topography. Routes, which should be periodically reviewed, can be established through use of computer modeling, observation, and operational experience or a combination of the three.



# ORGANIZED COLLECTION

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Organized collection of garbage/recyclable materials is when the local government ensures that solid waste and recycling services are provided in the manner requested. This could be done by:

1. Public sector providing the service directly
2. Franchising
3. Contracting with one or more service providers

In a community without organized collection, residents subscribe independently with a waste hauler. This is referred to as “open” or subscription service. The benefits of organized collection include the following:

- All residents receive the same level of service, which ensures that garbage is managed properly, particularly if residents cannot “opt out” of the program and increases the likelihood that recycling services will be utilized, if included in the program.
- The local government has more control over the level of service provided, as service requirements, penalties, and remedies for poor or non-performance are specifically laid out in the contract or franchise agreement.
- Outreach and education are easier to implement, as services are standardized, therefore the same education and outreach materials can generally be used for the entire area served.
- Efficiencies can be gained by either having one hauler serve all residents, or having one hauler serve contiguous geographic areas, which hopefully leads to lower service costs.
- There are fewer vehicles collecting materials, resulting in less wear on public roads, enhanced safety, and reduced noise and air pollution.



# ORGANIZED COLLECTION

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As stated above, organized collection can be provided by the public sector or by a private service provider through a contract or franchise agreement. These two terms, and their differences, are described below.

## Contract

A contract is a formal agreement between two entities (in this context, a city, county, authority or district, and a private hauler) for specified services to be provided at a certain price for a certain length of time. Typically, the contract is awarded through a competitive bid or proposal process, which also may include a negotiation process. When a local government contracts with a hauler, the government tends to have more oversight and involvement in the services. For example, the local government often pays the hauler(s) directly and bills residents either on their property tax bill or on a utility bill. Similarly, the local government may have more involvement in monitoring customer service. The degree to which the local government is involved varies, however. By definition, a contract is exclusive. It stipulates that a hauler will be the service provider for a defined area or group of customers.

## Franchise

A franchise is a formal agreement between a public entity and one or more private entities (depending on whether the agreement is exclusive) to provide services in a particular area (e.g., municipality, county, authority, or district). Franchises often are awarded through a competitive procurement process, which also may include a negotiation process. When a local government has a franchise agreement with a hauler, it tends to have less involvement in the service than it would if the hauler were contracted. For example, the billing and customer service is more commonly handled by the hauler(s) under a franchise agreement. In some regions, the local government sets the rates and franchisees must charge the rates prescribed. In some cases, franchised haulers are allowed to earn a certain profit level, and must submit annual reports indicating expenses and revenues. Franchise agreements can be exclusive or nonexclusive, as described in more detail in the following pages.

Changing a business or service from public ownership or control to private ownership or control, either through a contract or a franchise agreement, is referred to as privatization. A more in-depth discussion of contracting and franchising the collection of garbage/recyclable materials is provided in the next few pages.

# ORGANIZED COLLECTION

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## Contract Collection

Many local governments contract with private haulers to provide a specific, contractually-defined set of services with associated performance criteria. By definition a contract is exclusive—the agreement is between the local government and a single service provider. Under a contract collection system, it is possible to establish more than one service area, which could include residential and/or commercial collection services.

In that instance, the local government might have a contract with more than one service provider—each of whom would provide specified services in a designated portion of the jurisdiction. Communities typically award collection contracts through a competitive procurement process. Contract collection is very similar to franchise collection, with the following notable characteristics:

- **Contracts are exclusive.** In a contract, the contractor would be the only acceptable service provider for the designated services in the designated service area(s).
- **Mandatory or non-mandatory.** In a mandatory contract arrangement, all customers would be required to use and/or pay for the contracted services. In a non-mandatory system, those customers that elected to receive the services would be required to use (and pay for) the service provided by the designated contractor(s).
- **Include some or all services and/or sectors.** The collection contract could address all collection services to all sectors or be limited to a specific generating sector (e.g., residential) or waste stream (e.g., recycling, bulky waste, etc.). In some communities, only refuse collection or only recycling collection might be provided under contract. In some cases, refuse and recycling collection services are both provided under the same contract.
- **The local government may retain ownership of materials.** With most contracts, the contracting government has the responsibility for billing and collections for at least the residential component of the service area. By retaining billing responsibility, some state/district courts have determined that the local government remains “a market participant” and therefore owns the waste that is collected. As owner of the waste, the jurisdiction can require the contract holder to dispose of collected materials to a specified facility.
- **The local government typically pays the contracted hauler.** Usually the local government pays the hauler directly, based on the number of customers or households and/or the type of services provided. It is common for the governing jurisdiction in a contract system to bill customers directly and bear the administrative burden and costs of billing, collections, customer turnover, and complaint management, at least for the residential sector. However, the local government may require that the hauler be responsible for billing and customer service.

Contracts typically last for a base period (usually between three and 10 years), and have one or two optional renewal periods. Based on research reported by the Solid Waste Association of North America (SWANA), contract terms that more closely approximate the useful life of vehicles (e.g., seven years, on average) tend to result in lower contract rates.

# ORGANIZED COLLECTION

## Franchise Collection

Under a franchise collection system, the local government would establish one or more franchise areas and would award a collection franchise through negotiations or through a competitive procurement with a single hauler or multiple haulers for the entire area. If the local government wants to have exclusive franchise agreements with several haulers, then the local government would first divide the geographic area into the desired number of districts. Haulers would then bid on the geographic area(s) they were interested in serving. In some cases, local governments limit the number of geographic areas for which haulers can bid to be a service provider.

The franchise can be considered a property right for the designated hauler(s) for the term of the franchise agreement. Thus, if the local government determines at any time during the franchise agreement to discontinue the franchise (except for reasons of non-performance), the franchisee might need to be compensated for lost earnings.

Under a franchise system, the responsibility for billing and collections typically falls on the franchisee. The franchisee retains ownership of the collected waste, and can deliver this waste to any acceptance facility. Other than the submission of reports and/or franchise fees to the authorizing jurisdiction (and maintaining minimum equipment and health/safety standards), the franchisee would continue to do business the way they would in an open collection system.

Many options exist under a franchise system, including:

- **The franchise can be exclusive or non-exclusive.** In an exclusive franchise, the franchisee would be the only acceptable service provider for the designated services. In a non-exclusive franchise, multiple franchisees would be authorized to compete within the designated service territory. As a rule of thumb, the fewer number of franchisees, the lower the rates that would be expected to be available to customers within the service area.
- **Participation can be mandatory or non-mandatory.** In a mandatory franchise, all customers would be required to use and/or pay for the franchisee(s)' services. In a non-mandatory system, those customers that elected to receive the services would elect to use (and pay for) the services provided by the franchisee(s).
- **Franchises can include some or all services and generators.** Franchises can address all collection services to all sectors (residential and commercial) or be limited to a specific generating sector (e.g., residential only) or waste stream (e.g., recycling, bulky waste, yard waste, etc.). Note that the ability to include certain sectors or types of materials may be impacted by state or local law.



# ORGANIZED COLLECTION

Table 1: Advantages and Disadvantages of Service Delivery Options

Service Delivery Option	Advantages	Disadvantages
<b>Subscription</b>	<ul style="list-style-type: none"><li>• Maximum customer choice</li><li>• Very limited government involvement</li><li>• Low administrative cost impacts</li><li>• Provides opportunities for small haulers</li><li>• Competition is assumed to ensure lower costs to customers (though costs may actually be higher than in “organized” systems)</li></ul>	<ul style="list-style-type: none"><li>• Increased air pollution and road impacts from multiple haulers serving a community</li><li>• Neighborhood aesthetic/safety impacts</li><li>• Lack of uniformity in service levels</li><li>• Low ability to enforce policies/ goals and improvements</li><li>• Higher costs to ratepayers because of routing inefficiencies</li><li>• No financial assurance generally provided, unless if required by licensure</li><li>• May not be able to find recycling in part or in whole with refuse collection fees</li></ul>



# ORGANIZED COLLECTION

Service Delivery Option	Advantages	Disadvantages
<b>Competitively Procured Contract</b>	<ul style="list-style-type: none"> <li>• Jurisdiction has more control of overflow of waste and recyclables than under franchise or open systems</li> <li>• Efficiencies are gained by having one hauler service each region, which generally result in lower costs to residents</li> <li>• Contract items often include penalties/remedies for poor or nonperformance</li> <li>• Competitive bid process can result in low rates</li> <li>• Financial assurance provided</li> <li>• Depending on how structured, may be able to have solid waste collection fees offset recycling collection costs</li> </ul>	<ul style="list-style-type: none"> <li>• Small haulers may not be able to compete with larger regional or national service providers</li> <li>• Cost of procurement</li> <li>• Potential disruption to customers resulting from change in winning hauler</li> <li>• Transition costs (start-up time for learning new routes, etc.)</li> <li>• Potential quality of service issues due to "low-ball" pricing</li> </ul>
<b>Competitively Procured Franchise Agreement</b>	<ul style="list-style-type: none"> <li>• Competitive bid process can result in low rates</li> <li>• Service providers selected on the basis of technical and financial ability to provide the requested services</li> <li>• Contract items often include penalties/remedies for poor or non-performance</li> <li>• Financial assurance provided</li> <li>• Depending on how structured, may be able to have a solid waste collection fees help offset recycling collection costs</li> </ul>	<ul style="list-style-type: none"> <li>• Small haulers may not be able to compete with larger regional or national service providers</li> <li>• Cost of procurement</li> <li>• Potential disruption to customers resulting from change to successful bidder</li> <li>• Transition costs (start-up time for learning new routes, etc.)</li> <li>• Potential quality of service issues due to "low-ball" pricing</li> </ul>

The United States Environmental Protection Agency has example documents and best practices that public works directors can incorporate into their contract or franchise agreements with waste haulers. Visit [www.apwa.net/epatransformingwaste](http://www.apwa.net/epatransformingwaste).

# CHARGING FOR SOLID WASTE SERVICES

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When determining how to charge for solid waste services, a set of internal criteria should be selected to determine what needs or goals you are hoping to most closely meet. These will vary and considerations may include:

- **Customers, in terms of**
  - service
  - acceptability
  - rate stability
  - Equity
- **Costs and ease of**
  - operations and maintenance
  - overall implementation
  - enforcement
- **Impacts on**
  - waste stream
  - revenue and risks
  - other area providers
  - landfill capacity

## Types of Systems for User Fees

Keeping in mind your needs and considerations, below are user fee options for implementation:

- Multi-tiered / flat rate and property tax
- Proportional
- Variable rate

Each system has advantages and disadvantages to the service provider, customers, and community.

# CHARGING FOR SOLID WASTE SERVICES

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## Multi-tiered / Flat Rate and Taxes

Multi-tiered pricing provides a simple rate structure, minimum enforcement efforts, and a stable revenue base. This rate structure provides for pickup of residential waste at a fixed charge or flat fee. There are two tiers with this system, the first in which fees are assessed through local taxes or through regular periodic charges and are generally used to cover fixed costs. Second-tier fees are based on the amount of waste thrown away by customers and are used to cover collecting and disposing of the waste. The flat fee is set by obtaining the total revenue requirements to serve the customers, and dividing by the number of customers or service. Multifamily accounts may be charged a fixed fee per unit or per building. Alternatively, all properties could be charged based on assessed value.

### Advantages

The flat fee rate design is easily calculated, clear, simple to explain and enforce, and can provide a stable and predictable revenue source for the solid waste service provider. It can also be easily implemented into a billing system.

### Disadvantages

Lack of price signals to customers may lower the incentive to recycle and reduce waste.

### Options

- **Limited pickup system under a flat rate system.** Under this system, limits are placed on the number of containers picked up per household. The service provider has the option of picking up extras at no additional charge, leaving the extras for the next pick up, or charging for the number of containers over the allowed limit.
- **Unlimited pick up under a flat rate system.** With this system, the service provider collects all the waste the customer puts out. A benefit of this system is a decrease in illegal dumping, however, there is no reward for conservation or additional charges for overuse of services, possibly resulting in an increase to the waste stream.



# CHARGING FOR SOLID WASTE SERVICES

## Proportional Pricing

Proportional pricing offers a direct relationship between amounts of waste and price. This system charges residents a per unit amount for each waste container they fill. These are pre-paid systems in which a customer puts all their waste out for collection in official bags or tags they purchase from their solid waste provider or its agents. Only waste that is in the official bags or tagged is collected.

A bag or tag system can dramatically improve recycling incentives over a flat fee system. It is fair in that it costs more for customers to dispose of more waste and less for customers to dispose of less waste. Additionally, a bag or tag system allows flexibility for the waste that customers put out. Customers pay for service on the actual amount of waste they put out for collection allowing them to have control over the cost of their bills and changes in their routine waste behavior can directly and immediately reduce their costs.

The two basic structures for charging for bag or tag systems:

- The entire charge is assessed to the customer through the price of the bag or tag. Under this structure, if the price of the bags includes the full cost of service, the service provider may not require a billing system.
- The customer pays part of the cost of the system through a customer charge, and part of the cost through the purchase price of bags or tags—a per bag or tag additional fee. There are several variations of this system. This customer charge portion may be implemented as an annual or semi-annual customer charge or as a monthly charge. The charge may be billed through a property or other tax method, or through a separate billing. The payment of the customer charge may entitle the customer to a basic level of service or specified number of bags or tags, with extras to be purchased at an additional fee.

Under each of these systems, the customer pays more as they put out more waste for collection which allows for a waste reduction and recycling incentive.



# CHARGING FOR SOLID WASTE SERVICES

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## Advantages

Charging for solid waste services provides a strong waste reduction incentive to customers because they must pay for the collection of each bag they placed at the curb. Therefore, customers have an incentive to reduce their waste habits and increase recycling and composting. This could result in lower costs to the provider because residents would need to purchase bags from the provider or retail stores which may result in lower administrative and program costs.

## Disadvantages

Charging for solid waste may cause possible revenue uncertainty. Customers decide when they buy bags or tags, in bulk or a few at a time, creating fluctuations in revenue.

## Options

- **Fully distribute cost option for bag/tag system.** One method to calculate the charge for a bag system is to determine the full revenue requirements for the collection system and distribute those costs across the price of the bags or tags. Under this system, the price of the bags reflects the total average cost of providing the solid waste collection service, including the fixed and variable components of providing service. In this case, the cost of providing solid waste collection service is distributed evenly among all bags collected, and the charge per bag would be the same for all bags collected.

A problem with setting rates is that revenues may be unpredictable, as estimated usage differ from actual usage. Using average costs as the price of each bag does not accurately reflect the costs generated in the system. A major cost associated with a collection system is getting the vehicle and crew to the site to collect the first container of waste. The cost of collecting additional containers is much smaller than the fixed cost. Dividing total revenue requirements by the number of bags requires an estimate of the number of bags that will be sold. If the number of bags sold is fewer than estimated, the revenue collected may fall short expectations.

- **Marginal cost and customer charge option for bag/tag system.** With this option, the customer's payment for collection and disposal service is broken into two portions: a customer charge paid through a monthly bill and a separate per bag fee. The payment of the monthly bill would allow the customer to put out one service level per week, or the customer may be required to purchase all bags used for the separate fee.

The customer charge or the basic service level charge covers the fixed costs of providing service. This would be all or part of costs such as administration and overhead, the billing system, and getting trucks on the street. The price associated with the extra bags would then include the variable costs of providing the service. The that vary with the amount of waste collected include such things as transfer, hauling, and disposal. This allows for a more reliable source of revenue than a fully distributed cost option. As the major cost is the fixed cost, the recycling and waste reduction incentive reflected in the cost of the bags may not be enough to encourage waste reduction and recycling.

If a basic service level is provided in the customer charge, the basic service level should be set low enough to maximize the waste stream reduction incentives. Enforcement would not be complicated if all users receive the same basic service level.

# CHARGING FOR SOLID WASTE SERVICES

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- **Incentive-based cost option for bag/tag system.** With an incentive-based cost system, the fixed costs are divided and collected through a customer charge, however, the customer charge does not reflect the full fixed costs. In order to provide a stronger incentive to reduce waste and recycle and use fewer bags, the price of the bags or tags is set higher than the actual variable cost of providing service. A variation on this system would include a basic level of service with the payment of the customer charge. In this case, the cost of the first bag collected is less than additional bags collected.

This alternative offers a greater incentive to minimize waste but there is a risk with setting rates. As customers reduce the need for additional bags, insufficient revenue may be generated to cover fixed costs and a rate change could be necessary.

## Variable-rate Pricing

Variable-rate systems offer a “subscription” container size in which customers are billed based on their selected subscription, a specified number of carts or units of service that will be collected weekly. An additional fee would be paid for waste discarded above their subscription level. The price of any additional containers may be more than or less than the initial container, depending on goals of the service provider which would result in potential incentives or penalties to the customer. A variable rate can be used for both single family and multifamily customers. The use of subscription levels serves several purposes:

- Allows customers to be billed on an advanced billing basis
- Provides an incentive for customers to regulate their waste generation
- Does not require collection staff to carry route books to record actual service levels
- May not vary revenues because the customer generally cannot change service levels often

Under this system, rates are calculated for each service level and may be structured so customers supply their own containers, or these may be provided by the service provider. Variable cart rates can offer longer term rate stability in several ways; with more price sensitive use of solid waste services, long run costs may be lower than with a fixed fee alternative. In addition, variable cart systems offer more flexibility to estimate a variety of cost functions and allow customers to keep better control over the size of their bills.

### Advantages

Variable-rate pricing offers increased control over the waste reduction incentive. Depending on goals, service providers can charge a price for additional containers that is higher than the subscription level price. This additional charge will create a strong incentive to reduce and recycle. The flip side, however, is that customers may dispose of their waste in other ways if they feel pricing is unfair.

# CHARGING FOR SOLID WASTE SERVICES

## Disadvantages

Overall, there may be higher costs to the service provider. Multiple subscription levels mean providing customers with multiple sized containers and billing appropriately. This could result in more expense to implement and administer.

## Options

- **Cost-based.** Under a cost-based rates system, the rates for service are based on the service provider's costs: fixed and variable. Usually, the minimum subscription level is used to determine the fixed costs per user. All customers share in covering the fixed costs of the system which allows those costs to be recovered. Variable costs would be used to determine rates for each additional container or increase in service level.
- **Incentive-based Cost.** Under an incentive-based system, the rate for each additional container or increase in subscription is greater than the actual cost of service for that increment. This provides a two-part incentive for reducing the amount of waste disposed:
  - a penalty for putting out extra waste
  - a reward for putting out less waste

A problem with incentive based costs is that the rates are based on anticipated service levels. As a portion of the fixed costs are carried by these higher service levels, a decrease in anticipated usage could result in a failure to cover a portion of the fixed costs of collection. The higher the discrepancy between the cost of service and the rates, the greater the risk of under-recovery of revenues for the system. The more aggressive the rate incentive, and the more successful the rates are in inducing customers to put out lower levels of waste, thus the greater the risk of under-recovery of revenue.

There is not one perfect solution for all providers. These pricing structures or combinations may be successful or not, depending on the needs and goals of your organization.



# PARTNERSHIPS

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Solid Waste divisions have and can build many partnerships to help keep communities clean and litter-free.

Keep America Beautiful (KAB) has affiliates with counties and municipalities that deal litter prevention, beautification, and recycling. Affiliates can be standalone nonprofits or connected with the local government. When looking at partnerships with local KAB affiliates, look at ways to work with each other and not overlap on work to improve efficiencies. Collection systems need to be in place after litter pickups and river/stream cleanups.

Partnerships can also form with local watershed associations. These associations look to protect local watersheds with cleanups, water quality monitoring, and other practices. These associations will do regular river/stream cleanups, which create trash piles. These piles will consist of tires, shopping carts, debris, clothing, and pretty much anything you can think. Again, collection systems will need to be created to pick up these piles in an effective manner that aligns with departmental or organizational structures.

Lastly, the partnership between solid waste and the police department could be beneficial, particularly when tackling issues associated with homelessness. Often, the police department or code enforcement department will call upon solid waste to assist with homeless camp

cleanups. Working with the police to clear and secure the area will be crucial to a successful cleanup.

Homeless camps can present numerous challenges. Homeless camps are usually located near fresh water sources and railroad tracks, not the most accessible environments for large trucks and equipment needed for cleanups, such as backhoes, claws and clam shells. Homeless camps can also accumulate biohazardous waste that must be removed for safety and health of others in the community. This is where heavy equipment is beneficial rather than labor. Additionally, these camps can also produce good amounts of electronic waste, scrap metal, and hazardous waste. All types of materials need to be properly collected, source separated, and disposed according to state laws and landfill regulations. Finally, the coordination of the cleanup can be challenging. While the police may want to sweep the area and move the homeless out as quickly as possible, the tasks involved may take some time for solid waste to coordinate and implement based on staff availability, daily operational schedules, and access to resources. Coordinating with the public safety team to schedule cleanups on smaller route days would, of course, be ideal.

In forming partnerships, organizations must be able to work seamlessly in achieving common goals and keep in mind the mutual benefits the collaboration can bring.



# KEY PERFORMANCE INDICATORS

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Key Performance Indicators, or KPIs, are measurements of progress toward departmental or company goals. They shine light on strategic and operational improvement, create an analytical basis for decision making, and they are quantifiable and actionable. Generally, meaningful KPIs are specific, measurable, attainable, relevant, and have a realistic timeframe.

There are five steps to determining your KPIs:

## 1. Establish goals and objectives

To measure performance, start with developing departmental goals and objectives. What as a department, company, or organization do you want to accomplish? Once these are established, you can start building metrics from the bottom up. Examples of goals:

- Reduce garbage to dirt ratio
- Increase landfill life
- Increase landfill gas revenue
- Reduce waste generation

## 2. Establish critical success factors (CSF) from the goals and objectives

CSFs are a small number of key areas that you want to focus on to be successful. They are specific conditions that measure meeting your goals within a time frame.

## 3. Establish KPIs from CSF

KPIs are calculated measures that quantify the CSFs and enable the measurement of that strategic performance.



# KEY PERFORMANCE INDICATORS

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## 4. Collect Measures

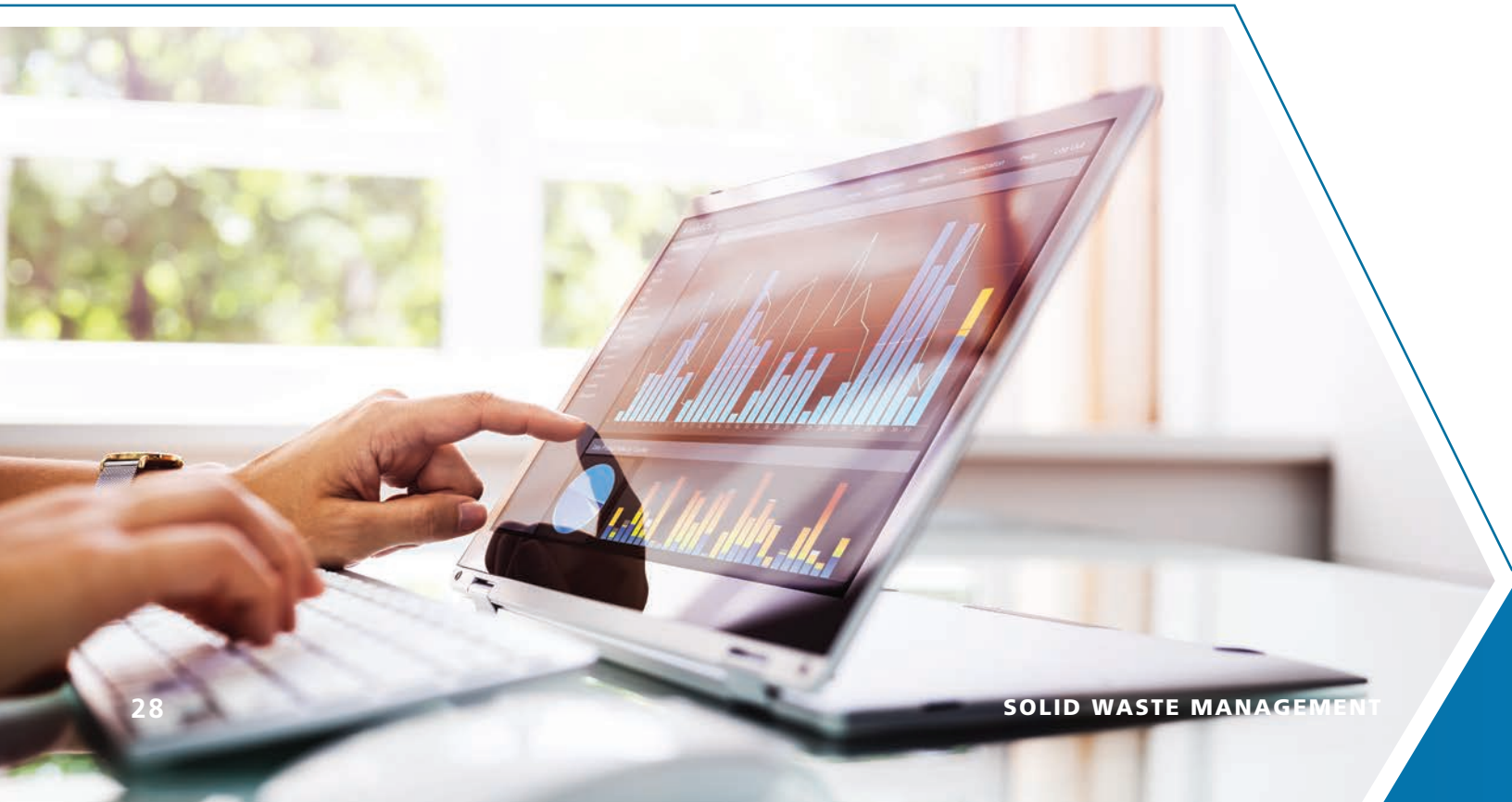
Measures are raw numbers which may not be useful on their own, but when related to each other provide meaningful information. Data points are the main driver of a measure. Data points are essentially points that collect specific data, for instance “pounds of refuse collected per day.”

Each data point has either an automatic data collection or manual data entry. Automated data collection requires attaching a query to the data point, then pointing that query at a given data source. A data source can be anything from an Excel spreadsheet to an on-premises server, to a software program. Some performance management programs may be able to actively collect data regularly from other software in use in your organization. Other measures may not have a data source which means manual data entry is required monthly to measure performance.

## 5. Calculate Metrics from Measures

Metrics are calculations of measures and are expressed as ratios, averages, rates, or percentages. Once data points are created and connected to a data source, metrics can be figured. Metrics are created by figuring out what measures can give us the desired result.

A goal may be to reduce waste generation per capita with a target of less than 5.48 pounds per person; a metric may be daily pounds of waste generation per person. The metric takes the total pounds of waste received at a landfill and divides it by the average population. If the metric for a month was a total of 5.79 pounds per person, an organization would be able to direct resources in the community to help initiate change in by providing more recycling options—compost, organics, glass, etc.



# KEY PERFORMANCE INDICATORS

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Deciding on what KPIs will be beneficial to your organization depends on what you hope to achieve. Some organizations may not have space or natural resources for a new landfill and essentially must work with what they have and extend its life for as long as possible. Important KPIs for this situation are:

- **Refuse placed to cover material ratio.** This data is important because the less amount of cover used to cover the refuse, the more space is left in the landfill and the longer it will remain open. This is calculated by dividing total tons of refuse received at the landfill by the total tons of cover (dirt).
- **Years of landfill life remaining.** The organization needs think about how to continually provide the customers and residents safe and efficient solid waste management for the foreseeable future. Through fine-tuning public behavior (recycling, composting, organics collection), the organization can successfully serve the community for many years beyond the estimated date of closure. Unfortunately, landfills do not forever. As public behavior changes lowering rate of waste generation and less cover used, the life of the landfill will slowly be affected. Decomposition and compaction are considered in the equation, as well as population growth.

Some additional examples of KPIs to track can include all areas of a typical organizations operational functions may be for internal purposes only or public information:

## Customer Service

- Percentage of customers using curbside recycling
- Surveyed customers satisfied with customer service
- Surveyed customers satisfied with recycling collection
- Surveyed customers satisfied with residential garbage collection
- Surveyed customers satisfied with commercial garbage collection
- Missed stop work orders – residential
- Missed Dump Work Orders – commercial
- Wait times at location
- Percentage of calls answered
- Percentage of calls resolved in one call

## Employee Development

- Percentage of annual reviews completed on time overall
- Percentage of annual reviews completed on time per work group

- Number of training hours overall
- Number of training hours per work group

## Employee Development

- Disposal costs per ton
- Revenues as percent of budget
- Days cash on-hand at end of period
- Expenses as percent of budget

## Disposal

- Waste to cover ratio
- Leachate disposal cost per gallon
- Landfill gas put to beneficial use
- Years of landfill life remaining

## Fleet

- Vehicle availability
- Average age of active fleet
- Vehicle age
- Miles per gallon
- Total miles driven
- Vehicle availability

## Recycling

- Per capita waste generation tons per person
- Curbside organics collected in tons
- Community compost collected in tons
- Daily pounds of waste generation per person in pounds
- Curbside recycling rate
- Contaminated curbside recycling %

## Refuse Collection

- Percent of collectible residential garbage stops collected
- Present of collectible residential recycling stops collected
- Percent of collectible commercial garbage stops collected
- Percent of collectible commercial recycling stops collected
- Routes – residential and commercial

# KEY PERFORMANCE INDICATORS

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## In more detail...

- 1. Refuse to Cover Material Ratio.** Every day, the refuse received must be covered. Different forms of cover including dirt, gravel, wood chips, tarps, and snow (season-permitting) can be used. This data is important because extending the life of the landfill is an important goal for the organization. The less amount of cover used to cover the refuse, the more space is left in the landfill and the longer it will remain open. This is calculated by dividing total tons of refuse received at the landfill by the total tons of cover (dirt) used, which includes alternative cover.
- 2. Years of Landfill Life Remaining.** Through fine-tuning public behavior (recycling, composting, organics collection), the organization can successfully serve residents/customers for many years beyond this estimated date. As public behavior changes lowering rate of waste generation and less cover used, the life of the landfill will slowly be affected. Decomposition and compaction are considered in the equation, as well as population growth.
- 3. Landfill Gas Revenue (%).** Many landfills collect methane gas from collected refuse in the landfill. This gas is typically sold to convert to electricity. The revenue from selling landfill gas is used to subsidize disposal costs, therefore lowering customer rates.
- 4. Daily Pounds of Waste Generation per.** Organizations typically have the mission of reducing per capita waste generation by better promotion of the diversion of recyclables. This is important because it contributes to extending the life of our landfill.
- 5. Customers Using Curbside Recycling (%).** An organization may have a goal to increase recycling efforts by improving recycling options for businesses and increase education/outreach amongst the community. Again, it is important because it contributes to extending the life of the landfill.
- 6. Disposal Costs per Ton (\$).** SWS has a goal to reduce the costs of disposal by improving disposal practices, which includes selling the methane gas pulled off the landfill.
- 7. Curbside Recycling Rate (%).** Again, important because it contributes to extending the life of the landfill.
- 8. Scheduled Stops Served (%).** An organization wants to serve the community efficiently and meet their needs, and the refuse and recycling should be picked up every day.
- 9. Surveyed Customers Satisfaction with Customer Service (%).** Customer satisfaction survey provides valuable feedback on how to continuously improve the service delivered to customers, whose demographic will be constantly changing.