

GUIDANCE FACT SHEET: LANDFILL OPERATIONS

The objective of landfill operations is to effectively dispose the greatest amount of waste in the engineered landfill while protecting the environment, workers and customers. Effective disposal operations include measures that promote landfill gas (LFG) production and facilitate LFG collection and utilization.

Waste Receipt/Scalehouse Operations

All customers entering the facility should be logged to properly account for the volume of waste received. Weigh bridges improve billing, enable performance monitoring and route rationalization of collection vehicles, and provide a good record of waste quantities and landfill use history for load tracking and forward planning. The scalehouse is also the first point of a waste screening program, discussed next.

Ideally, weigh data should be recorded electronically, which allows for better management oversight of waste management operations. Additionally, incoming and out-bound traffic should be weighed. Two weigh bridges, one dedicated to in-bound traffic and the other to out-bound traffic, should be installed if the landfill receives enough vehicles to justify two weigh bridges.

The weighbridge is the heart of the solid waste system's management information system. Computerized weighbridge systems are connectable directly to municipal managers for purposes of oversight and data analysis. Consider engaging an independent firm of known integrity to operate the landfill weighbridge and compile regular management information reports, and possibly also post staff from the municipality at the weighbridge.

Waste Screening Program

A waste screening program prevents unauthorized disposal of medical, hazardous and other undesirable wastes, such as friable asbestos or liquid wastes. Waste screening is also essential to minimize misleading weighbridge results that are possible from collection workers adding to their vehicle weights through soil, rock or water. A waste screening program can include:



detected after being unloaded.

- Verifying with the waste hauler the origin of the waste.
- Random inspections of waste loads (shown in photo).
- Training working face personnel to recognize unacceptable wastes.
- Collecting and chemically analyzing at a laboratory a sample of the waste.
- Procedures for managing unacceptable that is

Prior to waste receipt, haulers should be advised of acceptable and unacceptable waste types and signs should be posted at the entrance with similar information.

Waste Compaction

Waste is compacted with tracked compactors or bulldozers to increase density and increase the stability of the waste mass. The heavier the equipment, the higher the density that can be achieved. However, heavier equipment tends to be more expensive to purchase and operate, including fuel use and maintenance costs. Typically, three to five passes of heavy equipment over waste placed in 300 mm layers (after compaction) provides the best compaction without unnecessary equipment use and expense. Fewer passes results in lower density of the compacted waste; more passes provides little additional compaction.¹

Wastes are typically placed in lift heights up to 3 meters high. The size of the working face should be as small as possible to limit the amount of blowing litter and the amount of daily cover that must be placed. The working face should be sloped to inhibit stormwater from flowing onto it, thereby becoming leachate. Temporary diversion berms can also be used to direct stormwater away from the working face.

Cover Material

Cover materials at the landfill include daily, intermediate and final cover. A 15-centimeter layer of daily cover is placed at the end of each working day over the area where waste was placed to reduce vectors, odors and blowing litter, and to shed surface water to prevent it from becoming leachate. Daily cover is typically obtained from onsite or nearby soil borrow areas. It can be scraped off before additional waste is placed to reduce loss of airspace to clean soil.



Alternate daily covers, such as synthetic tarps, contaminated soils, foundry sand, or mulched vegetation, can be used. Synthetic tarps are removed before additional waste is placed. The benefit of alternate daily covers is that more of the airspace is used for disposal of waste materials, rather than filling the landfill with clean soil. This is especially helpful if there is not enough clean soil available and soil must be purchased.

A 30-centimeter layer of intermediate cover is placed in areas that will not receive waste for an extended period of time, but are not at final grade. Intermediate cover is normally clean soil and provides additional protection against vectors, odors, nuisances, as well as promoting surface water runoff and a surface to grow a stand of grass.

¹ International Solid Waste Association, Working Group on Sanitary Landfill Guidance No. 7, Working Face.

A layer of final cover is placed over the waste once the landfill reaches its ultimate height. The final cover system can be composed of natural clay soils, a combination soil/synthetic membrane liner system, or soil cover only with vegetation.

It is beneficial and good practice to cap-as-you-go. Final cap is placed once every couple of years and allows better operation of the landfill gas system due to reduced oxygen infiltration. It also allows construction of the final stormwater management and provides a more aesthetically pleasing view to neighbors.

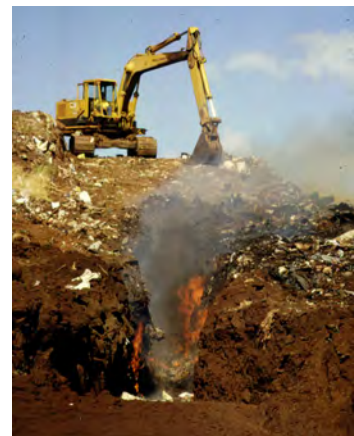
A soil layer is placed over the final cover system for vegetative growth. Normally grasses or vegetation with a shallow root system are planted in the vegetative soil layer to protect the membrane liner.

Waste Pickers

Usable material may be recovered from the landfill by waste pickers. Recycling from the working face may also be conducted; however, worker safety must be considered. Waste pickers, and all other personnel working on the landfill, must be advised of safety concerns at the landfill, especially when working near waste disposal vehicles, heavy equipment, and the landfill gas collection system. Children and domestic grazing animals should not be allowed at the landfill working face because of the significant risk from contaminants and equipment.

Fires

Waste loads should be screened to verify that “hot loads” are not disposed since they can cause a fire. Fires may also be caused by operating the landfill gas collection system with too much vacuum. Landfill fires are dangerous to personnel, can cause slope stability problems, and can affect the operation of the landfill gas collection system. Landfill fires combust organic waste materials that would otherwise decompose anaerobically to Produce LFG. Therefore, fires are detrimental to LFG collection.



Leachate Management Systems

All stormwater that comes in contact with waste materials must be treated as leachate. The leachate collection system in the bottom of the cell is typically piped to a leachate management system consisting of:

- evaporation from ponds.
- pre-treatment and discharge to sewer.
- treatment and discharge to waterway.
- re-circulation to the waste mass.
- direct discharge or hauling to waste water treatment plant.

- destruction in LFG-fueled leachate evaporations.

Leachate should be removed or released as needed to prevent overfilling tanks or sumps, which could cause a release of leachate to the environment. If leachate is stored on-site until being hauled to a waste water treatment plant, a daily check of the amount of leachate stored is recommended.

Leachate recirculation may be conducted at well managed stable landfills. Leachate recirculation systems must be managed properly to avoid adding too much liquid which can cause leachate break-outs and slope stability concerns. The landfill must also be monitored for increased gas emissions and formation of fires.

Passive leachate evaporation is possible in arid climates. This is often achieved through aeration in holding ponds or storage lagoons.

Safety

There are many potential dangers at a landfill including:

- confined spaces where oxygen may be limited or dangerous levels of hydrogen sulfide may be present.
- working around heavy equipment and truck traffic.
- construction activities which can lead to lifting, vibration, noise, or other injuries.
- working around landfill gas which is potentially explosive, can cause anoxia, and carries potentially toxic or chronically hazardous volatilized refractory organics and heavy metals.
- exposure to dusts, chemicals, pathogens, bioaerosols, and sharps at the working face.
- potential for cave-ins or landslides due to uneven settling, burned-out zones, or saturation dangers associated with unloading waste at the working face or the citizen's convenience area.



A written safety plan is recommended to be prepared for each landfill. Safety plans should be regularly updated, particularly with regard to fire, police, munitions, and/or medical respondents in case of emergency, as well as safety officers and supervisory personnel. Proper equipment (safety vests, hard hats, safety glasses) should be provided to employees and they should be trained to recognize hazards, and in safe work procedures. Facilities must be provided for decontamination in case of contact with hazardous/infectious materials. Signage should be provided at the citizen's convenience area to guide citizens in safe procedures during unloading activities. Contractors should be provided landfill safety procedures and requirements prior to commencing work.

Stormwater Management in New Cells

When a new cell is opened, all liquid in the cell must be treated as leachate. Since new cells have little waste to absorb rainwater, this is when the most leachate is generated after a storm event. Since the leachate is directly entering the leachate collection system, the leachate can reach the leachate management system rapidly during or after a storm event. This can be managed by minimizing the size of the cell that is constructed, or using rain tarps or rain flaps to segregate rain water from the leachate collection system.

Sources of Additional Information

- The World Bank. www.worldbank.org/solidwaste