Solid Wastes Management

Industrialized nations are facing a problem with how to dispose of waste safely. Toxic and non-biodegradable types of waste can cause damage to the environment, and to human health, that can't be undone.

Waste management is a process that combines all the activities necessary for managing waste including collection of garbage, transportation, and disposal of trash. Its primary purpose is to lessen the waste of unusable materials and avoid potential environmental and health risks.

Benefits of Waste Management

- Better Environment
- Reduced Pollution
- Energy and Resources Conservation
- Increases Employment Opportunities
- Helps Create a Change

Methods of Waste Disposal

1. Reducing Waste Generation
2. Recycling
3. Incineration
4. Composting
5. Sanitary Landfill
6. Disposal in Ocean/Sea

Disposal of Wastes on Landfill

Land disposal is the most widely used practice all over the world. However, dumping of solid wastes on land has serious environmental impacts. Most important, the leachate through the waste infiltrates the soil contaminating the groundwater .Land disposal should therefore be carried out in a properly designed landfill an engineered landfill .

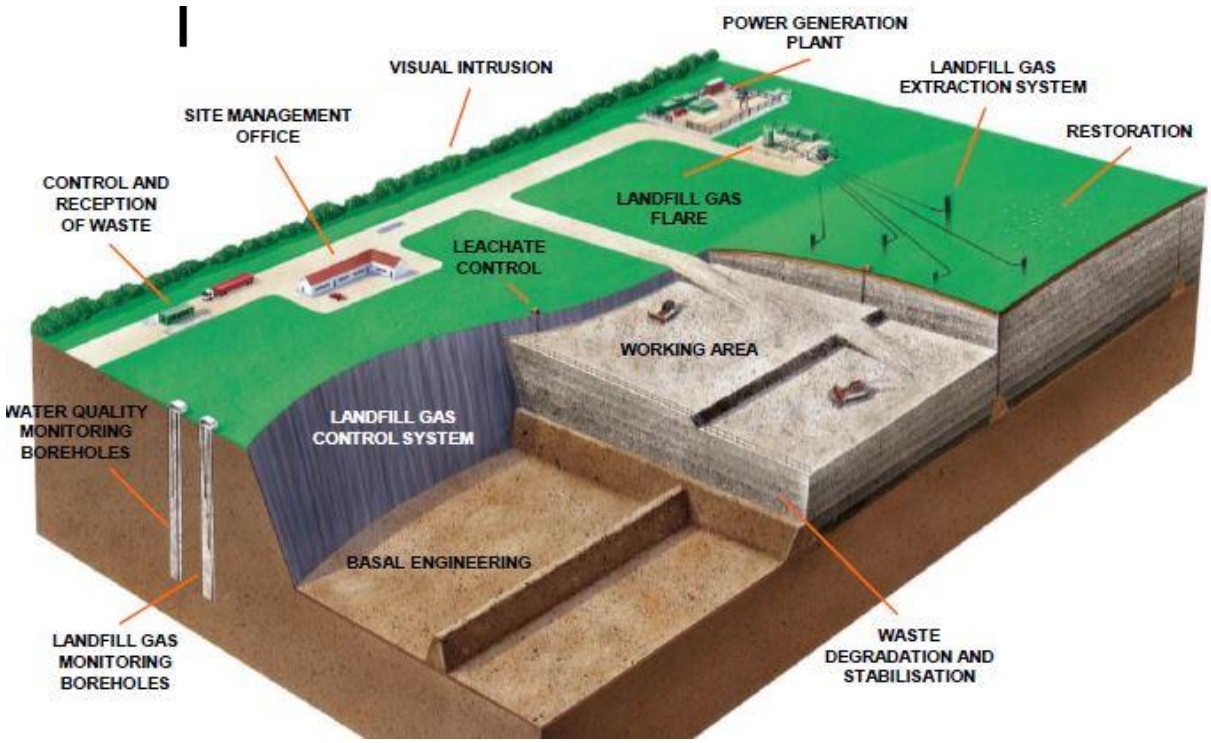


Figure: Properly designed landfill.

TYPES OF LANDFILLS

Landfills can be classified as:

Trench Landfills: is the most widely used method of landfilling (Fig. 3.1 a). These landfills are suitable for areas where natural depressions are available and water table is very deep.

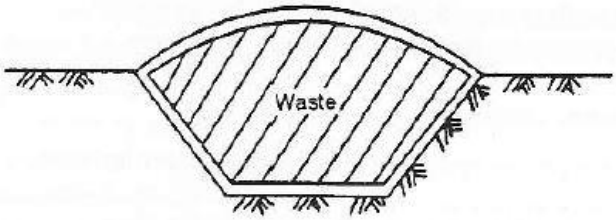


Fig. 3.1 (*a*): Trench Landfill

Area Landfills : are on-ground landfills (Fig. 3.1 b). These are provided where natural depressions are not available . Waste materials are disposed off on the ground surface and covered with a layer of soil .

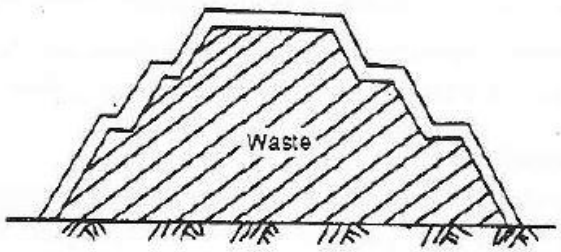


Fig. 3.1 (*b*): Area Landfill

Slope Landfills: Slope landfills are provided in hilly areas (Fig 3.1 c). Solid wastes are disposed off on local foothills after providing a suitable liner and a leachate collection system.

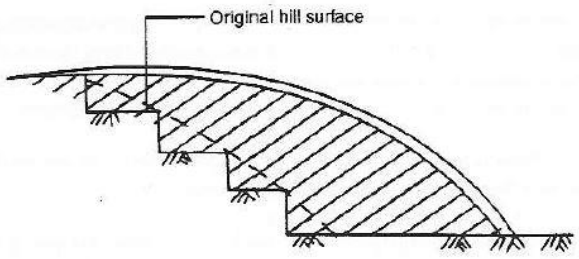


Fig. 3.1 (*c*): Slope Landfill

COMPONENTS OF A LANDFILL

A cross-section of a landfill site is given in Fig. 3.2.

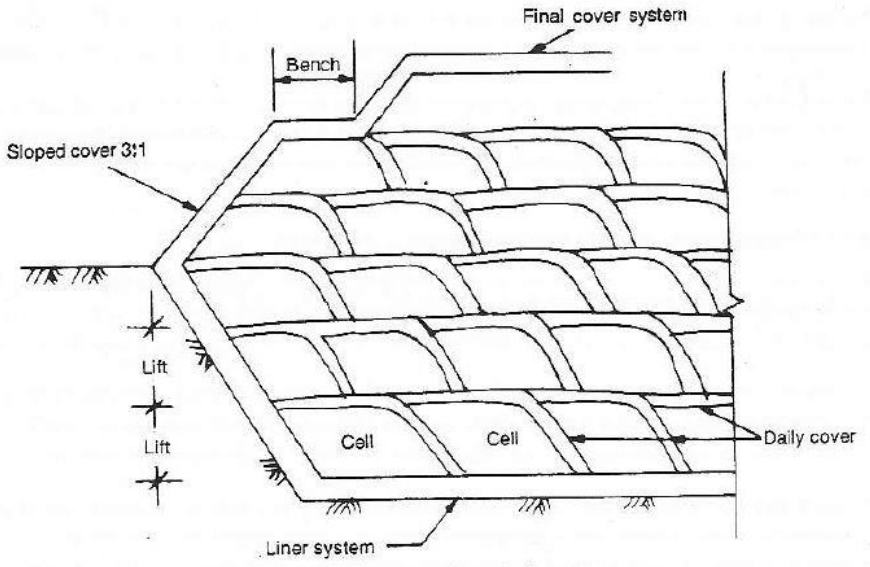


Fig. 3.2: Cross-section of a Landfill

Cell: The volume of waste deposited in a landfill site during one operational period . The operational period is usually one day.

Daily Cover: Waste material is provided with a 'daily cover' with usually a 15 to 30 cm thick layer of soil. The cover material prevents surface runoff from entering into the wastes so as to reduce the leachate formation.

Lift: is the height of cells that depending upon the cell volume and varies from 2 to 4m .

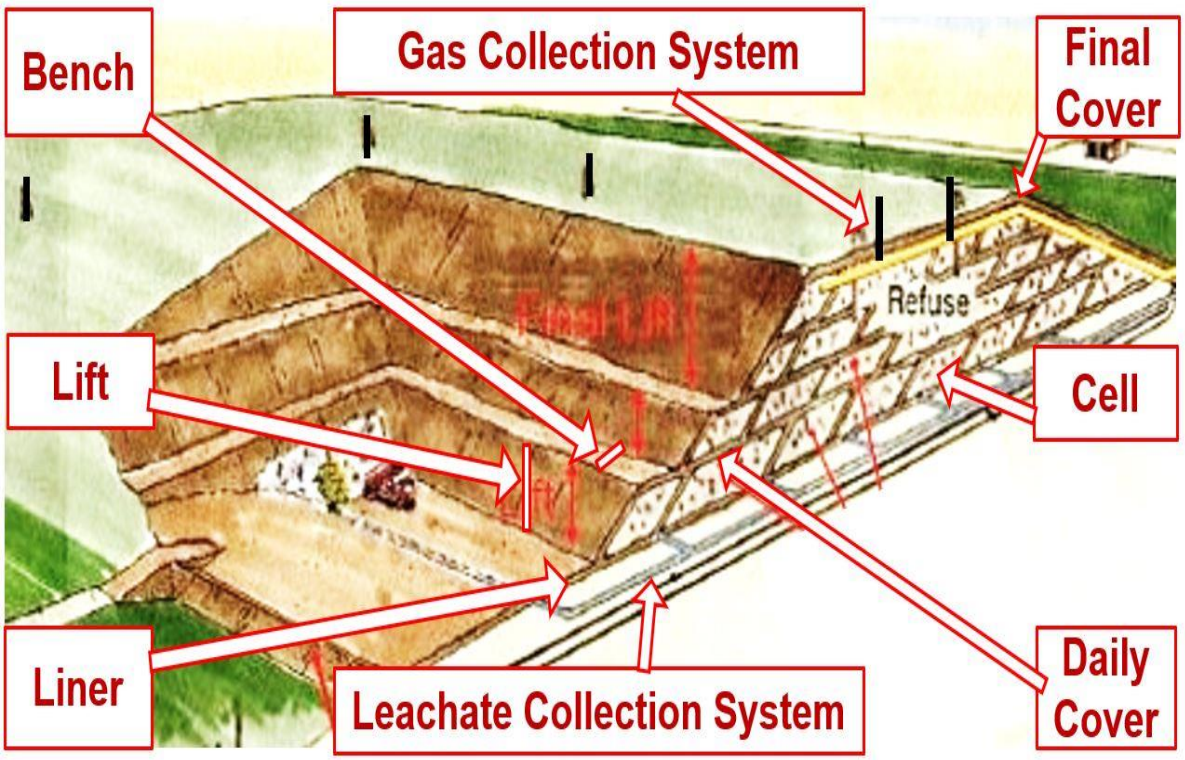
Bench: A 'Bench' is provided in the aboveground landfills when the height of wastes deposited is more than 10 to 20m. It increases the stability of the landfill slope and facilitate surface drainage.

Leachate Collection System: 'Leachate' is produced when surface water infiltrates into a landfill. Leachate should be carefully collected through a suitably designed leachate collection system.

Liner: is a layer of impermeable material (e.g. clay) provided at the base and sides of landfills to prevent infiltration of leachate into the groundwater .

Gas Collection System: A number of gases are generated during biological degradation of wastes in the landfills. These gases are collected through a network of pipes and wells provided in the landfills.

Final Cover: is provided after the landfill site is filled to its full capacity. And also helps maintain the beauty of the area.



LANDFILL SITE SELECTION

Important considerations in the selection of a landfill site are as follows:

• Landfill should be located away from the community areas but should be easily approachable.

• Land area available should be sufficient for at least five years.

• Groundwater table should be deep in the area. It should not be less than 5m .

• Soil to be used for daily cover should be available nearby.

• Local climate e.g. temperature, wind velocity, and wind direction should be taken into account in the site selection.

• A comprehensive Environmental Impact Assessment (EIA) should be carried out before finalizing a site for a landfill.

LANDFILL OPERATIONS

Landfill should operate 24 hours all the year round. It should be ready to receive the waste as and when it arrives at the site. Landfill operations include construction of cells, leveling and compaction of wastes, providing daily cover etc. These operations are discussed below.

Weighing of Waste: Wastes received at the landfill site should be weighed over a weigh bridge. It is necessary to maintain a database of the quantity of wastes received at the landfill site.

Waste Deposition in Cells: Layout of cells is an important part of landfill operations and it depends upon the type of landfill and methods adopted for disposal of wastes.

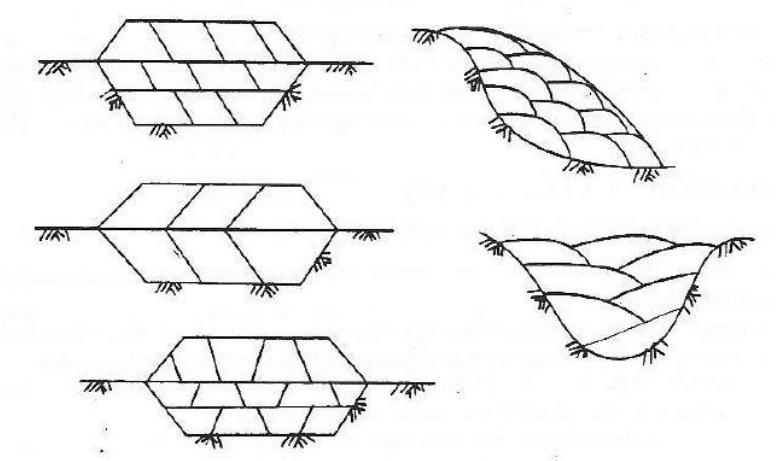


Fig. 3.4: Various Types of Cell Layouts

Providing Daily Cover: Wastes deposited in the cell should be covered at the end of each day. In general, a layer of 15 cm thick soil is sufficient for daily cover.

Safety and Security: To avoid health hazards to workers or users due attention must be paid to the type of wastes received. Hazardous wastes received, should be properly handled to avoid any exposure to human beings or environment. Workers should be provided with special uniform including protective shoes and gloves etc.

Record Keeping: It is necessary to maintain a proper record of wastes received at the landfill. This will be needed frequently e.g. to make payment as well as to ensure compliance of legal requirements.

Example 1: A colony having a population of 65,000 generates solid wastes at the rate of 2 kg/capita/day. The compacted specific weight of solid wastes in landfill is 650 kg/m3 and the average depth of compacted solid wastes in landfill is 5m. Determine the required landfill area.

Solution :

Total solid wastes generated from the colony = 65000 x 2 = 130,000 Kg/d

Volume of solid wastes = 130,000 / 650 = 200 m^3/d

Area required = 200 / 5 = 40 m^2/d

Area required annually = 40 x 365 = 14,600 m^2/year
= 1.46 ha/year