

Civil Engineering Notes Methods of Waste Disposal

Mainly it is divided into two categories

1. Conservancy System/Method
2. Water Carriage System/Method

1. Conservancy System

It is the system different types of waste/refuse are collected separately and disposed off.

A. Garbage is collected separately in dustbins and conveyed by covered carts or lorries to suitable place. The combustible and non-combustible garbage is sorted out. The former is burnt and the later is buried in low lying areas.

B. The human and animal waste (feces and urine) are collected in pans from lavatories and is then carried by labors in carts or lorries for disposal outside the city where it is buried for manure. The human and animal waste are also called night-soil.

C. The storm water is conveyed separately by close and open channels and discharge into natural streams. This system is obsolete now and can be used in rural areas where there is scarcity of water.

This system has the following **disadvantages**.

- **Cost.** The system has less initial cost but the maintenance cost is high because of working labors.
- **Design of building.** The lavatory has to be built away from the residential building which causes inconvenience.
- **Insanitary condition.** The night soil is carried once in 24 hours while it becomes insanitary after 5-6 hours causing bad smell and fly nuisance.
- **Labor problem.** If the labour goes on strike the system totally fails.
- **Land requirements.** The night soil trenching ground required large areas of disposal.
- **Foul appearance.** It is highly undesirable to allow night soil carts to pass through roads of the city.
- **Open drains.** Storm water flowing in open drains cause unhygienic condition in the area.
- **Pollution of water.** The liquid wastes from lavatories may seep into the ground polluting groundwater.
- **Risk of epidemic.** The sewage is conveyed openly and is not properly disposed of causing risk of epidemic.

2. Water Carriage System

In this system water is used as a medium to carry wastes to the point of final disposal. The quantity of water is so high (99.9%) that wastes becomes liquid which is carried by the sewers. The garbage is collected separately as in conservancy system. The storm water may be disposed of separately or combined with sanitary sewage.

This system is universally used nowadays because of the following advantages.

1. **Cost.** Though the initial cost of the system is high but the maintenance cost is less.
2. **Compact design.** The lavatories can be accommodated inside the building which causes compact design of building and also convenience.
3. **Hygienic conditions.** The sewage is carried in covered drains thus the risk of epidemic are reduced.
4. **Land requirement.** Less land is required for treatment and disposal thus making the system economical.
5. **Treatment.** Proper treatment of sewage is possible to make the sewage suitable for disposal.

The only disadvantage of this system is the wastage of water (99.9% of water).



Velocity in Sewers

Limiting Velocity

Self cleansing velocity

The sewers should be laid at such a gradient that a minimum velocity, which will prevent the silting of particles in sewers are developed. Such a minimum velocity is known as self cleansing velocity.

Self cleansing velocity is generally

= 0.6 m/s for sanitary sewer

= 1m/s for storm sewer

= (0.75-1 m/s)

Maximum velocity criteria

The upper limit of velocity is set by scouring action of sewage. If the velocity of flow exceeds a certain limit, the particles of solid matter start to damage the inside surface of sewers or in other words, a scouring action takes place. The maximum permissible velocity at which no such scouring action will occur is known as non-scouring velocity and it mainly depends on the material of sewers.

Generally,

Sanitary sewer = 2.4 m/sec

Storm sewer = 3 m/sec

Note: Manning's formula is generally used for finding velocity in sewer. Commercially available sizes (diameter) of sewers are

9" = 225 mm

12" = 305 mm

15"=380mm

18"=460 mm.

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