EWCE 333
Wastewater Engineering and Sanitation

Lecture 2

Instructor

Lt Col Kazi Shamima Akter, Ph.D., Engrs

Associate Professor

Department of EWCE, MIST

Lecture Details

Topics	Reference
• Functions of sanitation system • Types of sanitation system • Criteria for a good sanitation system • Appropriateness of sanitation system	Water Supply and Sanitation - Feroz Ahmed and Mujibur Rahman ITN -BUET

Functions of Sanitation System

With respect to human waste management, sanitation systems may be considered to have the following functions -

- **Excretion and storage**
- **Collection and transportation**
- **Process / Treatment**
- **Disposal / Recycle**

Types of Sanitation System

Whether the waste is stored, treated and disposed of at the point of generation or transported to somewhere else for treatment and disposal –

- On-site systems
- Off-site systems

Types of Sanitation System

Based on the methods of collection and conveyance–

- Dry systems
- Wet systems

Types of Sanitation System

Whether the systems allows infiltration or not–

- Permeable / Unconfined systems
- Confined systems

On-Site Sanitation Systems

- Wastes are collected, treated and disposed of at the point of generation.
- Examples – pit latrines and septic tank systems.
- Widely used in rural areas of both developed and developing countries, even in urban areas in absence of costly sewerage systems.
- Modification of this system includes ventilated pit latrine, pour-flush single and double-pit latrines, aqua privies, septic tanks and so on.

On-Site Sanitation Systems

The principles of on-site system are-

- Infiltration of liquids into the soil.
- Solids are retained, digested aerobically and have to be removed or a new pit has to be dug at regular intervals.
- It is primarily designed to dispose of human excreta.
- Wastewaters from cooking, clothes washing and bathing are collected in small drains & disposed of in soakaways for infiltration.

On-Site Sanitation Systems

- This system is most suitable for sparsely settled rural areas with low population density and low water consumption because of the system's dependence on the infiltration capacity of the soil for the disposal of the liquid portion of excreta.

- This system is not feasible for areas with high population density, high water consumption, and low infiltration rate of soil or high groundwater table.

Off-Site Sanitation Systems

- Waste is collected and transported to somewhere else for treatment and disposal.
- E.g. bucket latrine systems and conventional sewerage systems.
- The basic elements of this system are collection, transportation, treatment and disposal and/or reuse.
- The waste is collected either through house sewers or manually using buckets or vaults; transported either by cart, truck or sewer system to a suitable distant place where it is treated prior to disposal or reuse.

Off-Site Sanitation Systems

- Collection and transportation of the wastes through a sewer reticulation system requires that the waste be diluted by water. It is essential, piped water supply be available in areas where this system is to be applied.

- This waterborne system is by far the most satisfactory system of waste disposal provided sufficient funds are available for its construction and maintenance.

Dry Sanitation Systems

- In dry systems no water is used for dilution of the wastes.

- They are usually applied in unsewered areas with no piped water supply, e.g., pit latrine systems (on-site) and bucket latrine systems (off-site).

Wet Sanitation Systems

- In the wet system, the waste is diluted with flushes of water

- Suitable where piped water supply systems are available, e.g., septic tank systems (on-site) and conventional sewerage systems (off-site)

Permeable/ Unconfined Systems

- The liquid part of the wastes is allowed to infiltrate.
- Cause potential pollution of the groundwater.
- Example - pit latrines.

Confined Systems

- The liquid portion of the wastes is not allowed to infiltrate into the ground.
- No potential for groundwater pollution.
- Example – aqua privies, septic tanks etc.

Criteria for Good Sanitation Systems

- Simple and inexpensive in construction and operation
- Should not contaminate surface soil, surface water or groundwater
- Minimum handling of excreta and free from odour and unsightly conditions
- No access to flies, insects and animals

Criteria for Good Sanitation Systems

- Should use little or no water
- Should require little supervision and maintenance
- Should handle all waste and wastewater
- Should use little or no mechanical equipment

Appropriateness of Sanitation Systems

Purpose of sanitation:

- Health
- Privacy
- Convenience
- Cleaner Environment
- Prestige/Status

A good sanitation system should, therefore, be able to meet all the different requirements of the people.

Appropriateness of Sanitation Systems

Suitability of Sanitation System from the perspectives of -

- Level of Water supply
- Population Density

Appropriateness of Sanitation Systems

Level of Water supply:

---- On site pit latrine system would not be appropriate with piped water supply.

---- Water borne sewerage system (e.g., conventional sewerage system) is not a feasible option with bucket carried or hand-pump water supply.

Appropriateness of Sanitation Systems

Population Density:

----- On site system is more appropriate for low-density rural setting.

----- Off-site systems more suitable for high density urban centers.

Appropriateness of Sanitation Systems

