

# WASTEWATER ENGINEERING



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Q1

Ans

## WASTEWATER ENGINEERING

### Definition

Sanitary engineering, also known as public health engineering or waste water engineering, as the application of engineering methods to improve sanitation of human communities, primarily by providing the removal and disposal of human waste, and in addition to the supply of safe potable water.

- Wastewater also known as sewage is the liquid waste originates from household wastes, human and animal wastes, industrial wastewater, storm runoff, inflow and infiltration.

### Application in Safeguarding the Environment

Sewage system in a city is provided for safe disposal of wastewater. For this purpose sewer lines are used, it also prevent flooding of the area following a rainfall. The main purpose of sewerages system are as;

- (i) To provide a good sanitary environmental condition in a city.

- (ii) Thus sanitary engineering aims at the creation of such conditions of living which will not result into serious outbreak of epidemic diseases in a community.
- (iii) The disposal of human excreta to a safe place by a safe and protective means.
- (iv) To dispose of all liquid waste from a community to a proper place for preventing a favourable condition for mosquito, flies breeding or bacteria growing.
- (v) To treat the sewage so as not to endanger the water bodies, or land to get polluted where it is finally disposed of.
- (vi) Proper disposal method should be adopted to protect sub soil water from contamination.
- (vii) Reclamation and utilization of sewage.
- (viii) Recycling of solid wastes.
- (ix) Application of energy saving and emission reduction technology.



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## Ans RELATIONSHIP BETWEEN WASTEWATER

### GENERATION AND WATER SUPPLY

Average daily per capita consumption varies from 130 to 200 litres.

Local use depends on;

#### (i) Size of the city

Small communities tend to have more limited use of water. Unsewered homes have less use of water. Usually less than 40 L/cap/day. Cities having water using industries may result in high per capita use, thus waste water generation increases.

#### (ii) Industry And Commerce

Effect of industry has to be studied for individual type of industry. The industrial use has an indirect relation with the population. Also industries use auxiliary water supplies for some purposes. Wastewater obtained from this area is highly contaminated and required special treatment.

### (iii) Commercial

Commercial consumption largely depends upon the number of people employed in the business district. Uses of water in commerce are for sanitary and air conditioning etc. The typical commercial consumption taken is 10 to 15 L/m<sup>2</sup> of the floor area or 95 L/m<sup>2</sup> of the ground area. This wastewater is easy to treat and therefore economical.

### (iv) Characteristics of Population

Economic level of the population determines the use of water which usually ranges from 50 to 380 litre/capita/day. In the slum districts it usually varies from 50 to 100 litre/capita/day. The quantity of wastewater is directly proportional to the characteristic of population.

Q3

## ANSWER

A characterization of wastewater provides a wide variety of information regarding the type and concentration of contaminants present.

With characterization of wastewater we determine the nature of contaminant (physical, chemical, biological) and then design wastewater treatment plant according to the nature of contaminants.

Q4

## ANSWER

Characteristics of wastewater

### Physical Characteristics

- Odor
- Temperature
- Density
- Specific gravity
- Turbidity
- Color



## Chemical Characteristics

- PH value
- (COD) Chemical Oxygen Demand
- Organic matter
- nitrogen contents
- chloride contents
- Fats , oil and greases
- sulphides , sulphates and hydrogen gas

## Biological Characteristics

- Biochemical Oxygen Demand (BOD)
- Oxygen required for nitrification and microbial population.
- Most of bacteria are helpful in oxidation and decomposition of sewage.

Q5

Ans COMBINED SEWERAGE SYSTEM

Advantages

- 1) Both domestic sewage and storm water are carried in a single sewer, so construction cost is less.
- 2) The strength of domestic sewer is reduced because of dilution of storm water.
- 3) The sewers are of large size, and therefore the chances of their chocking are rare. It is easy to clean them.
- 4) In towns with narrow streets, this system is preferred.

Disadvantages

- 1) Initial cost is high because of large dimensions of sewers.
- 2) Because of large size of sewer, their handling and transportation is difficult.
- 3) Due to the inclusion of storm water, the load on the treatment plant increases and ultimately increases treatment costs.
- 4) During heavy rain the sewer may be overflow and may thus create unhygienic condition.



5) If the whole sewage is to be disposed off by pumping it is uneconomical.

## SEPARATE SEWERAGE SYSTEM

### Advantages

- 1) Size of sewers is generally less.
- 2) Since the sanitary sewage and storm water flow in a separate pipes, the quantity of sewage to be treated is less.
- 3) As the sewer are smaller in section, they can be easily ventilated.
- 4) Rainwater can be discharged into the streams or can be reused (recycled) without any treatment.

### Disadvantages

- 1) Since the sewers are of smaller size, it is difficult to clean them.
- 2) They are likely to get choked / blocked.
- 3) Initial cost is high when two separate sets are used.
- 4) Maintenance cost of system is also high.

→ I will suggest combined sewerage system because both domestic sewage and storm water are carried in a single sewer so construction cost is less and sewers are of large size so they are easy to clean.