

Questions – Septic Tanks

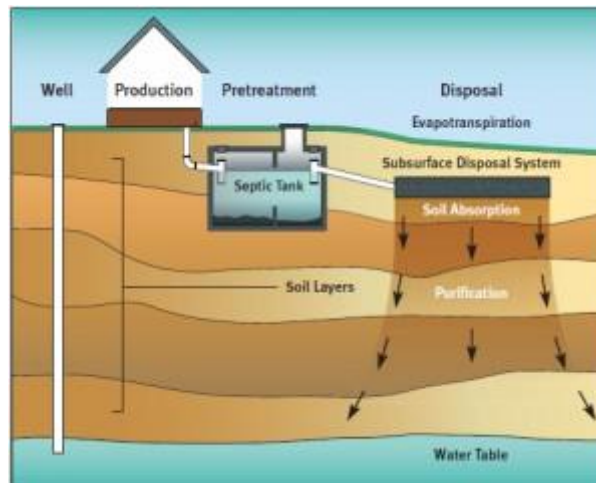
Q. Why Use a Septic System?

Septic systems are used when sewage treatment plants are not accessible.

- They safely but crudely treat and dispose of waste waters produced in the bathroom, kitchen, and laundry.
- These waste waters may contain disease-causing germs and pollutants that must be treated to protect human health and the environment.

Q. What Is a Septic System?

- Typically a 2-3 chambered tank where sewage is retained for sufficient time to partially break down.



- Creating a crude effluent with polluting potential.
- It consists of three main parts: the septic tank, the percolation field, and the soil under the percolation field.
- The septic tank is a watertight concrete box about 2.6 metres long and 1.5m tall.
- A precast tank, it is buried in the ground just outside the home.

While typically designed with a 3,800-litre liquid capacity, the size of the tank is legally determined by the number of bedrooms in the home.

Q. Describe effluent quality from septic tanks and its impact on environment.

The effluent may contain disease-causing germs and pollutants that must be treated to protect human health and the environment.

Typical characteristics are the Organic content which is the BOD (Biochemical Oxygen Demand) at 300mg/l. Suspended Solids about 200mg/l. The pathogenic content maybe over 10^6 organisms per 100mls of effluent and nutrient concentration may be 50-60 mg/l Nitrogen and phosphorous combined.

Pollutant	Typical Concentration (mg/l or otherwise stated)
BOD	300
Suspended Solids	200
Pathogenic Organisms (MPN/100 mls)	1 million/100ml
Nutrients (Nitrogen & Phosphorous)	60

The organic material will cause organic pollution in surface water which reduces oxygen conditions and fish kills are possible. Suspended solids may increase turbidity (cloudiness) and reduce light penetration for photosynthetic plants in water, thereby reducing oxygen from lack of photosynthetic activity. Nutrients may cause eutrophication (enrichment) of ponds and lakes, generating large algal growth and consequently reducing water quality. While pathogenic organisms may cause water borne disease in surface and ground waters, triggering 'boil water' notices and rendering the water supply unusable for the public.

Q. How is the septic tank sized?

The capacity of a tank should be calculated using the following

$$C = (180 \times P + 2000) \quad \text{where,}$$

C = capacity of the tank in litres

P = population served

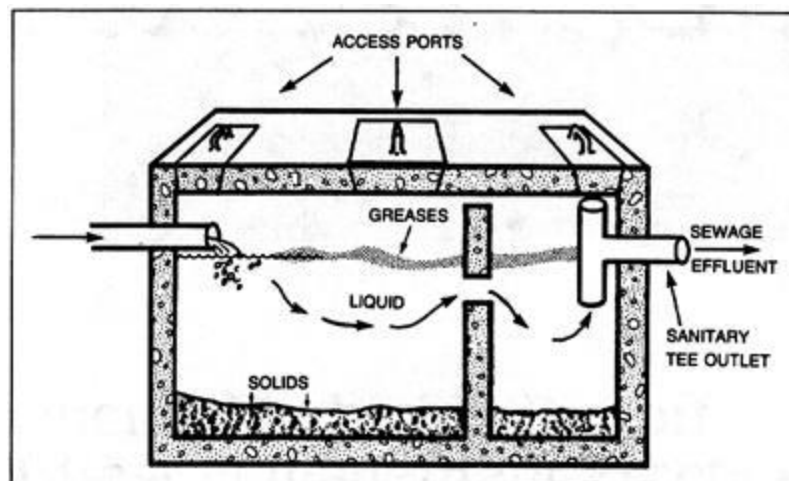
Q. Explain effluent attenuation in:

- a) The septic tank
- b) The percolation field.

a) The septic tank

Inside the septic tank, heavier solid materials settle to the bottom (sludge),

- Lighter greases and fats float to the top (scum), and the liquid (sewage effluent) flows out of the tank.
- An outlet baffle (or a sanitary tee at the outlet end) prevents solids from flowing out with the liquids.
- The tank's primary purpose is to retain the solids while releasing effluent to the percolation field.



- Settlement and sedimentation takes place in the tank; increasing the amount of solid settlement reduces the amount of BOD that is carried out in the waste liquor.

- The grease cover encourages anaerobic conditions and breakdown of organics occurs on the floor of the tank.

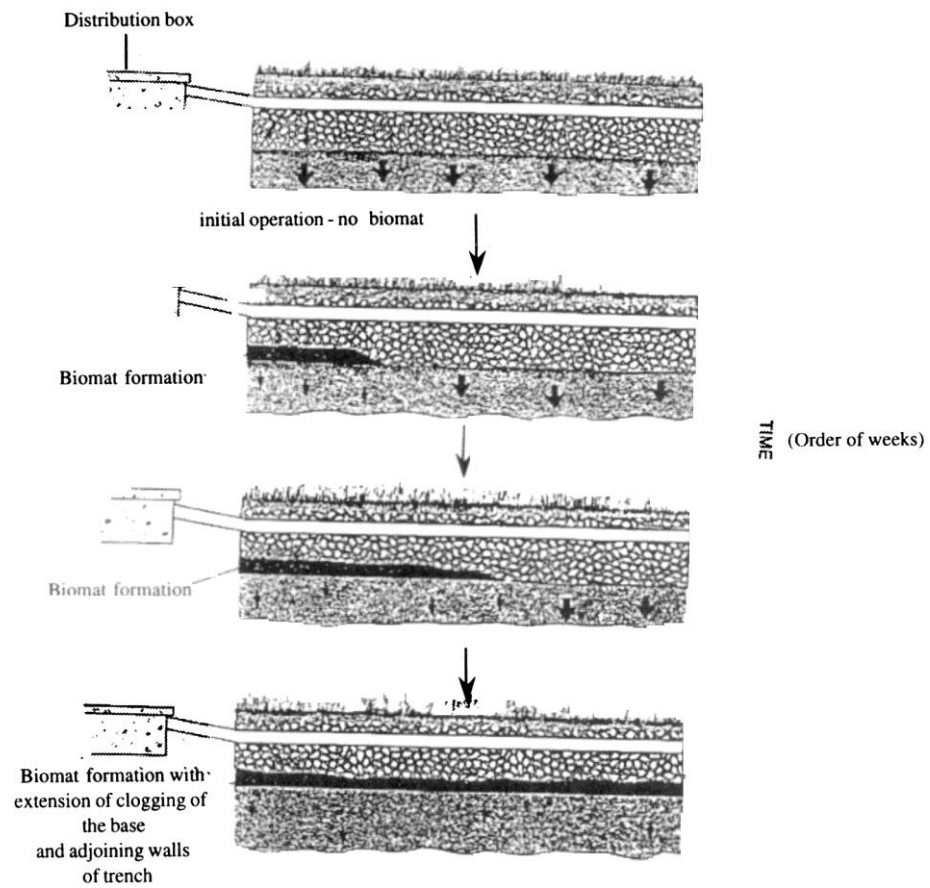
b) The Percolation field

- At the soil, many of the bacteria that can cause diseases are filtered out.

- Some of the smaller germs, such as viruses, are adsorbed by the soil until they are destroyed.

- The soil can also retain certain chemicals, including phosphorus and some forms of nitrogen. A grass cover can benefit from the nutrients thus reducing the nutrient load in the effluent.

- In the soil under the percolation field, a biomat develops under the percolation area and microorganisms in this biomat further reduce the organic load of the effluent, thus improving its quality as it percolates through the soil profile.



Development of the biomat after the tank/percolation field is commissioned.

Questions – Rainwater Harvesting

Q. What are the concerns about using rainwater for a potable supply?

The Catchment area is defined as the surface area upon which the rain falls and is collected.

The catchment areas is usually the roof, however for potable (drinkable) supply avoid zinc coatings, copper, asbestos or asphaltic compounds, also roofs with lead flashings or lead based paints should not be used.

Other catchment areas include patios, driveways but storm water collected at groundwater should not be used for potable supply unless purification system is used.

Rain is slightly acidic and so will dissolve and carry minerals along its route. Thus the quality will be a function of the catchment texture and pattern of rainfall. The best catchment materials would be clay, cement and concrete.