

# **SANITATION**

## **(PFE-302)**

**BY**

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# What is Mean by Sanitation?

- ❑ Safe Disposal of all human sewage and domestic wastes necessary to protect the health of the community to prevent epidemics and other diseases.
- ❑ Best way is to discharge domestic sewage into *septic tank and soakage pit or into bore-hole latrines.*
- ❑ But the garbage and other household refuse can be buried in a compost pit.

## Terminology Used in Sanitation

**Sewage:** Includes solids and liquid portions of the human excreta which enters the septic tank in combined form.

**Sludge:** Refers to that part of the sewage which after being acted on by the bacteria and settles at the bottom of the tank.

**Scum:** It is a partially submerged mass of floating solids that may form at the surface of the fluid in tank.

# SEPTIC TANK

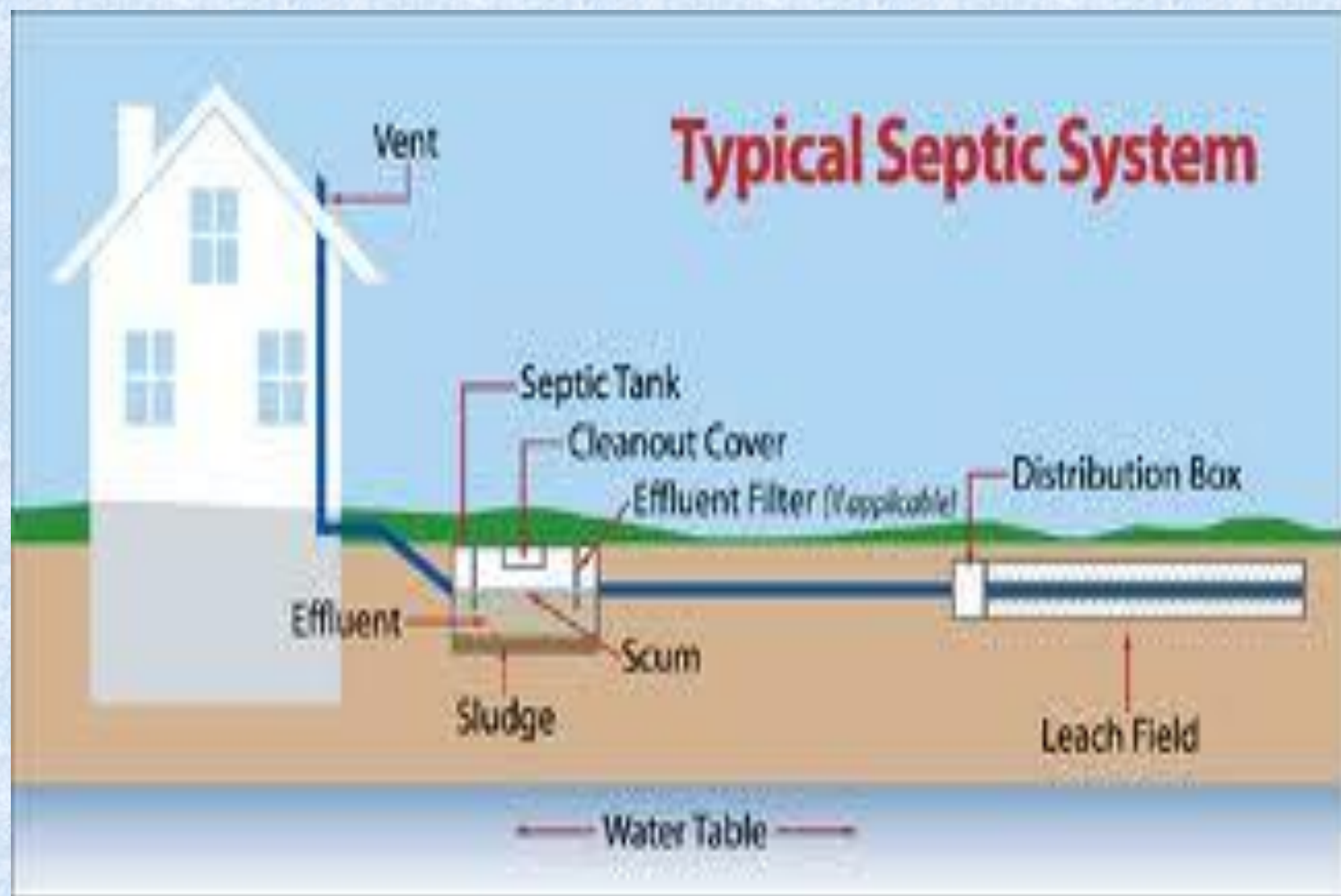
## Definition:

“Septic Tank is a closed water tight container in which untreated sewage is put so that it may be acted on bacterial”

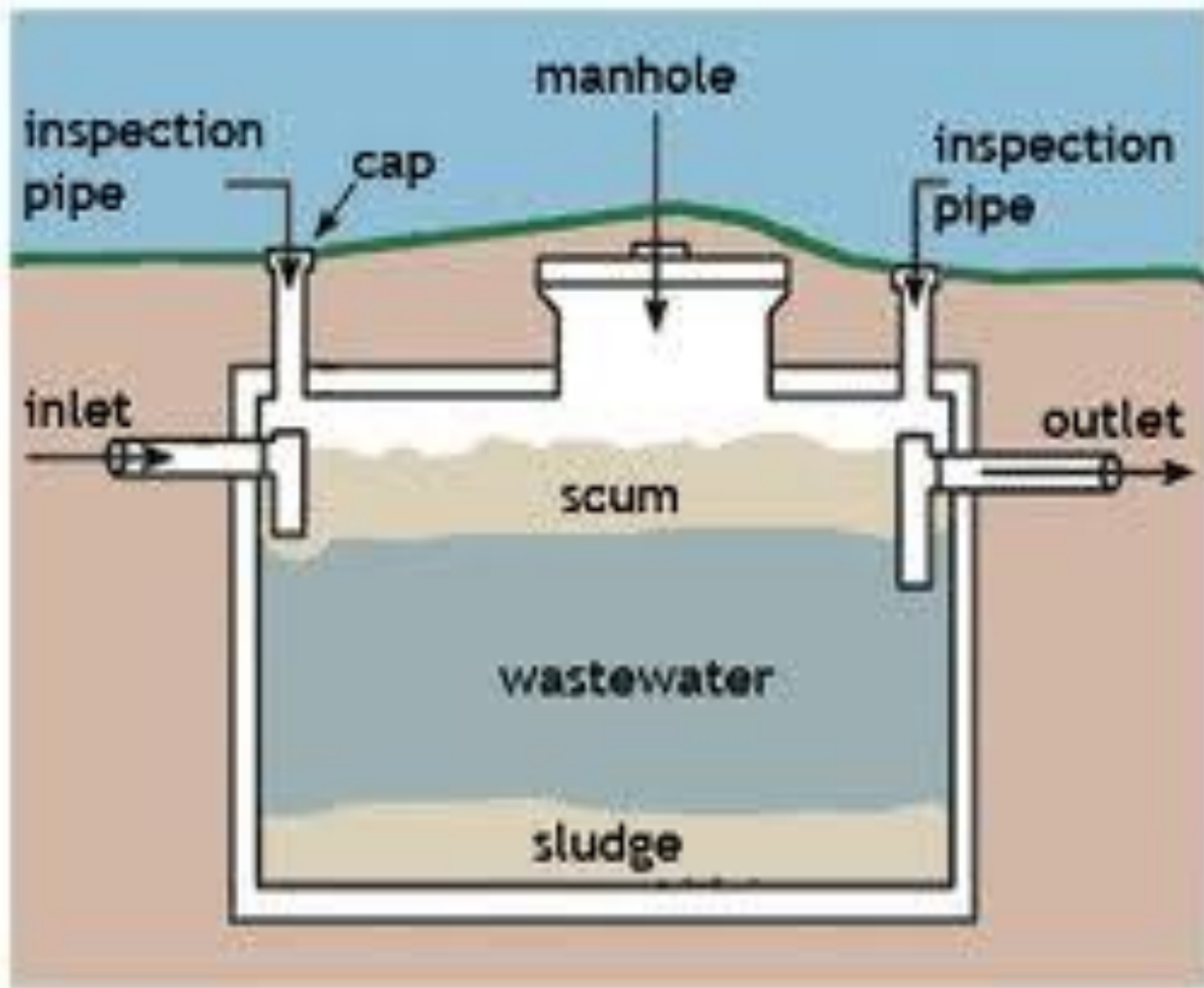
## Working Principle of Septic Tank

- ❑ Sewage and waste of the house come into septic tank and solid matters settle down at the bottom of the tank.
- ❑ Anaerobic Bacteria convert the sewage into liquid and gases during the process of digestion.
- ❑ In this way there is appreciable reduction in the volume of waste and it changes into semi solid condition, which is called sludge.
- ❑ It is necessary that septic tank is covered with water tight top roof slab. Septic tanks are generally constructed of brick masonry.

# Typical Septic System







# Septic tanks serve three functions:

## 1. *Removal of solids.*

- As sewage enters the septic tank, its rate of flow is reduced so that the larger solids sink to the bottom and soaps, grease and smaller solids rise to the surface.
- These solids are retained in the tank and the clarified effluent with suspended and dissolved solids is discharged.

## 2. *Bacterial Action.*

- The solids and the liquids in the tank are partially decomposed by bacteria and other natural processes. These bacteria are called anaerobic because they thrive in the absence of free oxygen.
- This decomposition of sewage under anaerobic conditions is termed “septic,” hence the name of the system (and the cause of the odor).



### *3. Sludge and scum storage*

Sludge is the accumulation of solids at the bottom of the tank, while scum is a partially submerged mat of floating solids that may form at or near the surface. Space must exist in the tank to store these residues during the intervals between pumping.

Otherwise, the sludge and scum will eventually be scoured from the tank and will clog the leach field and receiving soil.

# LOCATION OF SEPTIC TANK

- ❑ It should be located downhill from the source of water supply.
- ❑ Its recommended that septic tank never be close than 30 Mt. from any source of water supply.
- ❑ Tank should not be located in area liable to be flooded during rainy season.

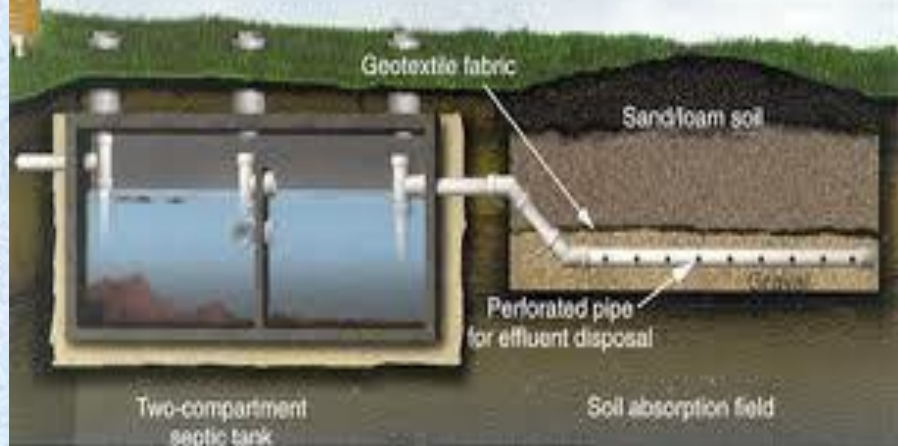
# CAPACITY OF SEPTIC TANK

- ❑ Capacity is most important consideration that determines the major dimensions of the tanks.
- ❑ For an average size of family of 5 members including 2-Adults and 3-Childrens, the tank capacity may be kept about 2.8 Cu.Mt.
- ❑ For an additional members, the capacity should be increased by 0.42 Cu.Mt. per member.
- ❑ The capacity of tank should not be smaller than 2.1 Cu.Mt.
- ❑ Shape of the tank may be rectangular, square and cylindrical.
- ❑ Depth of the tank should be such that liquid depths may be range between 0.75 and 1.5 Mt.

- ❑ Baffle wall may be made of RCC of about 7.5 cm thickness and placed about 15 to 22.5 cm away from the side wall.
- ❑ Function of baffle wall is to check the wave formation in the tank and to stop solids going out through the outlet.
- ❑ The inlet and outlet are provided at 15 cm above the ground level.



# Septic System and Drainfield



# CLEANING OF TANK

- ❑ Tank should be inspected at least once in two years and cleaned before the sludge level reaches the bottom of the outlet. Otherwise it will enter the disposal field or soakage pit and may clog the system.
- ❑ Tank should not be completely cleaned but a small residue of sludge be left at the bottom for starting the bacterial action later stage.
- ❑ Before the tank is put to use, it should be 1/4<sup>th</sup> full of water so that bacterial action starts without delay.

# DISPOSAL FIELD (Selection criteria)

- ❑ All sub surface absorption system should be kept 30 Mt. away from any water supply well, 15 Mt. away from any stream and 6 Mt. away from dwellings.
- ❑ Soil having slower percolation rate (5 cm/hour) is unsuitable for disposal field.
- ❑ A subsurface tile system is preferred for disposal system.
- ❑ Either 2cm dia. And 30 cm long cement pipe or 10 cm dia. and 1 mt. long glazed sewer pipes or perforated metallic pipes are used.
- ❑ Pipes are laid below 45 cm from the ground level and be place mouth to mouth without joining together.
- ❑ Individual lateral should preferably be less than 30 cm long and placed about 2 mt. apart.

- ❑ A slope of 0.25 to 0.4 % gives reasonable be absorption.
- ❑ Thick layer of coarse aggregates like brick or stone ballast is placed all around the pipe into the trench.
- ❑ About 18.5 sq.mt. of trench bottom area is desirable for a septic tank of 2.83 cu.mt. capacity.



# SOAKAGE PIT

- ❑ Sometimes, the disposal field is not big enough to allow for the construction of subsurface trenches. Under such conditions a soakage pit should be constructed to dispose of the fluid coming out of the septic tank.
- ❑ Care should be taken to see that the bottom of the soakage pit is above the water table in rainy season.
- ❑ Circular pits are preferred to rectangular or square types.
- ❑ For the tank size of 2.8 Cu.Mt., a soakage pit having a total surface area of 15 sq.mt. will be sufficient.
- ❑ Thus, a circular pit of 2.4 mt. diameter and 1.5 mt. depth can provide sufficient surface area to absorb the fluid coming out of the tank.

- ❑ A soakage pit should be filled with coarse and fine aggregates. The bottom should have coarse aggregates.
- ❑ The bottom should have coarse aggregate of 3 cm size to a depth of 20 cm followed by a 60 cm thick layer of coarse sand and 30 cm fine gravel.
- ❑ Remaining 40 cm space at the top must be occupied by coarse gravel.
- ❑ The pit may be kept uncovered or thin layer of 7.5 to 10 cm of soil may be place on top.
- ❑ No rain water should enter the pit.
- ❑ After a considerable use if soakage pit doesn't function effectively, it may be necessary to take all the material out of the pit to wash it with clean water and dry it in sun before its used again.

# Table: Requirements of seepage area

S. No.	Soil Type	Bottom area of trench per family of 5 members sq.m.
1	Clay with little sand	55.7
2	Sandy loam	28.0
3	Fine sand	18.6
4.	Coarse sand or gravel	18.6