

WATER SUPPLY AND SANITATION

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The term Sanitation is the science of safeguarding health, as per NSF of USA Sanitation is a way of life. It is the quality of living that is expressed in the clean home, clean farm, the clean business, the clean neighborhood and the clean community, being a way of life it must come from within the people, it is nourished by knowledge and grows as an obligation and an ideal in human relations.

The term environmental sanitation has been defined by WHO as the control of all those factors in man's physical environment which exercise a deleterious effect on his physical development, health and survival.

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- ❑ Safe drinking water and sanitation are important elements in safeguarding health of the people.
 - ❑ A survey done in 1990 showed more than 1 billion people in developing world lacked access to safe drinking water and nearly 2 billion people lacked an adequate system for disposal of their excreta.
 - ❑ The lack of water supply and sanitation is the primary reason for diseases transmitted via faeces, which are so common in developing countries.
 - ❑ Much of the ill health in developing world is due to poor environmental sanitation i.e.,

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1. Unsafe water.
 2. Polluted soil.
 3. Unhygienic disposal of refuse, sullage, and sewage.
 4. Poor housing.
 5. Insects and rodents.
 6. Air pollution.

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Water

Water is fundamental for health and life, the human body is 70% water.

safe & wholesome water: It should be free from

- ❑ Pathogenic organisms.
- ❑ Harmful chemical substances.
- ❑ Pleasant to taste.
- ❑ Useable for domestic purpose.

Sources of Water: There are three main sources

? Rain

? Surface water

Reservoirs

Rivers & Streams

Tanks, ponds & lakes

? Ground water

Shallow wells

Deep wells

Springs

Waterborne Diseases

- ❑ Viral – Viral hepatitis A, E, poliomyelitis, rotavirus diarrhoea.
- ❑ Bacterial – typhoid, para typhoid fever, bacillary dysentery, E-coli diarrhoea, cholera.
- ❑ Protozoal – amoebiasis, giardiasis.
- ❑ Helminthic – round worm, thread worm, hydatid disease.
- ❑ Lepto spiral – weil's disease.
- ❑ Presence of aquatic host – snail – schistosomiasis
cyclops – guinea worm
fish tape worm

Purification of Water

UN States that an estimated 80% of all diseases and over 1/3rd of deaths in developing world are caused by the consumption of contaminated water and 1/10th of productive time of each person is lost due to water related diseases.

Types of water purification:

- A. On a large scale
 - Slow sand filter
 - Rapid sand filter
- B. On a small scale
 - House hold purification

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- a. Boiling
- b. Chemical disinfection
- ❑ Bleaching powder
 - ❑ Chlorine solution
 - ❑ High test hypochlorite (HTH) per chloron
 - ❑ Ozone – it is a powerful germicide, it inactivates viruses very fast
 - ❑ Ultra violet rays

Rapid Sand Filter (Mechanical Filter)

The following steps are involved in the purification of water by rapid sand filter. A) Coagulation B) Rapid mixing C) Flocculation D) Sedimentation E) Filtration.

- 1.Coagulation: The raw water is treated with a chemical coagulant such as Alum.
- 2.Rapid mixing: The alum treated water is then subjected to violent agitation in a mixing chamber for a few minutes.
- 3.Flocculation: The next phase involves a slow and gentle stirring of the treated water in a flocculation chamber for about 30 minutes.

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This slow & gentle stirring results in the formation of a thick, copious, white precipitate (flocculent) of aluminum hydroxide.

4.Sedimentation: The coagulated water is now lead into sedimentation tank where it is detained for 2-6 hours, where the flocculent along with impurities and bacteria settle down in the tank, the super latent water is subjected to filtration. The filter bed consists of different layers of filter i.e, fine sand, coarse sand, gravel etc.

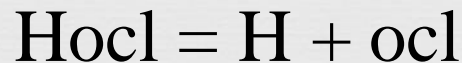
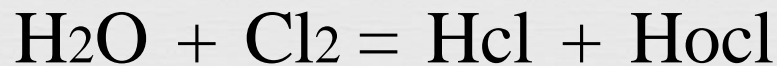
The filter water is then subjected to chlorination.

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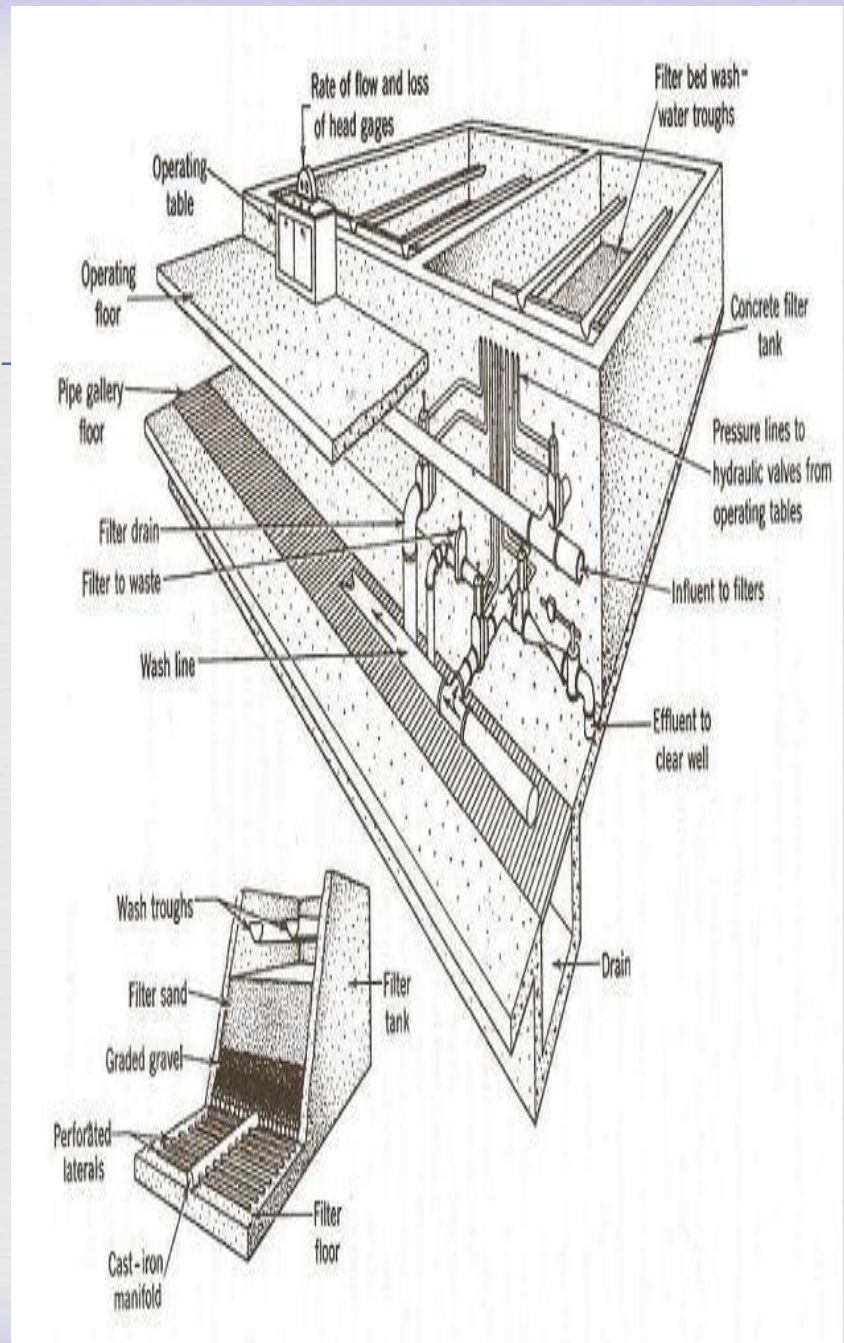
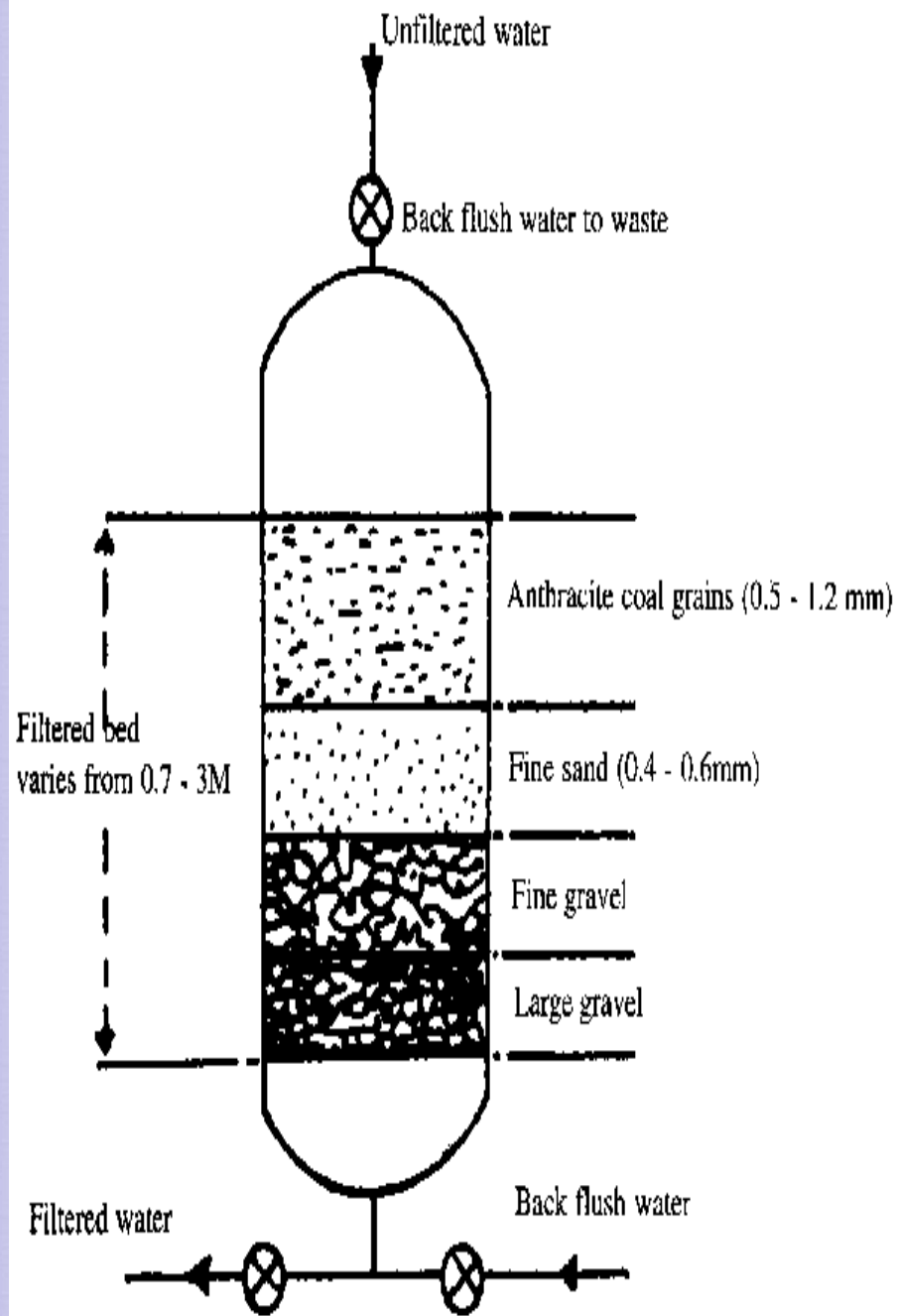
Chlorine kills pathogenic bacteria, but has no effect on spores, & certain viruses (polio, hepatitis) except in high doses, it oxidises iron, manganese & HS_2 , it destroys some taste & odour producing constituents, & controls algae.

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Action of Chlorine: When chlorine is added to water there is formation of Hcl and hypochlorous acids. The Hcl is neutralized by alkalinity of the water. The hypochlorous acid ionizes to form hydrogen ions and hypochlorite ions.



The disinfecting action of chlorine is mainly due to the hypochlorous acid & to a small extent due to hypochlorite ions.



Principles of Chlorination

- ❑ Water to be clear & free from turbidity.
- ❑ Chlorine demand of the water to be estimated.
- ❑ The contact period of free residual chlorine, should be at least 1 hour to kill bacteria & other viruses.
- ❑ A minimum of 0.5 mg/L of free chlorine is essential for 1 hour.

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Chlorine demand of the water is the amount of chlorine that is needed to destroy bacteria and to oxidize all organic matter and ammoniacal substances present in the water. The point at which chlorine demand of the water is met is called the “breakpoint” if further chlorine is added beyond the breakpoint, free chlorine starts appearing in water.

Safe Disposal of Human Excreta

Human excreta is a source of infection and it is one of the cause for environmental pollution if not disposed of hygienically. Human excreta contains disease producing germs, spores, cysts, eggs of helminths. Man gets infected by faeces through contaminated water, dirty hands, house flies, by eating raw and un washed vegetables grown on sewage water. Hence safe disposal of human excreta is very vital.

Types of Latrines

A. Unsewered areas:

1. Service type – outdated
2. Non service type
 - a. Bore hole latrine
 - b. Dug well (pit)
 - c. Water seal (RCA type)
 - d. Septic tank

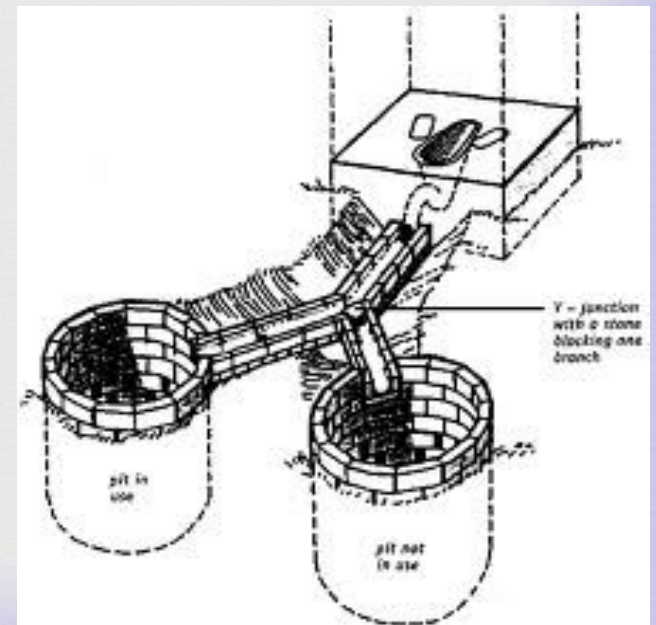
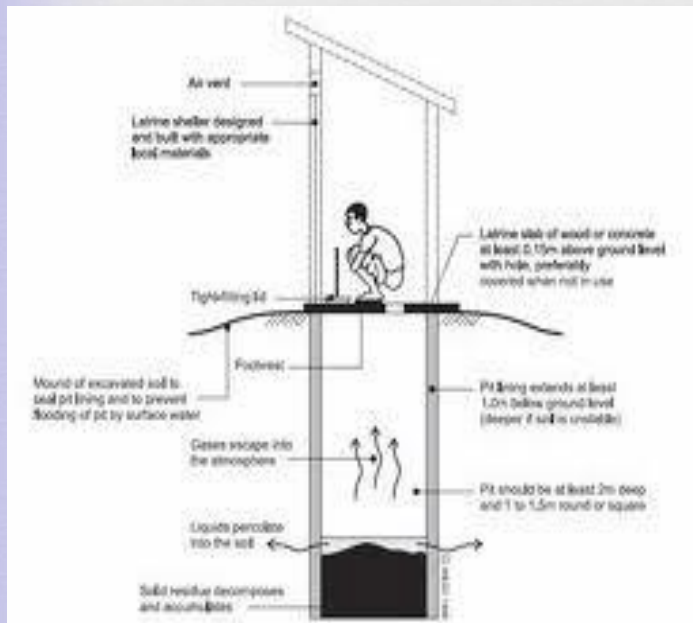
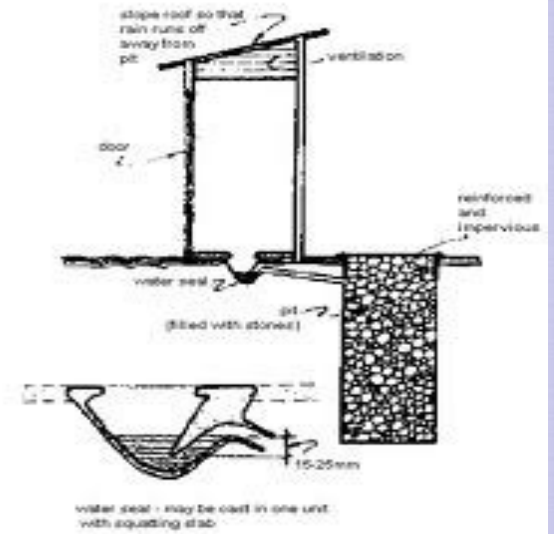
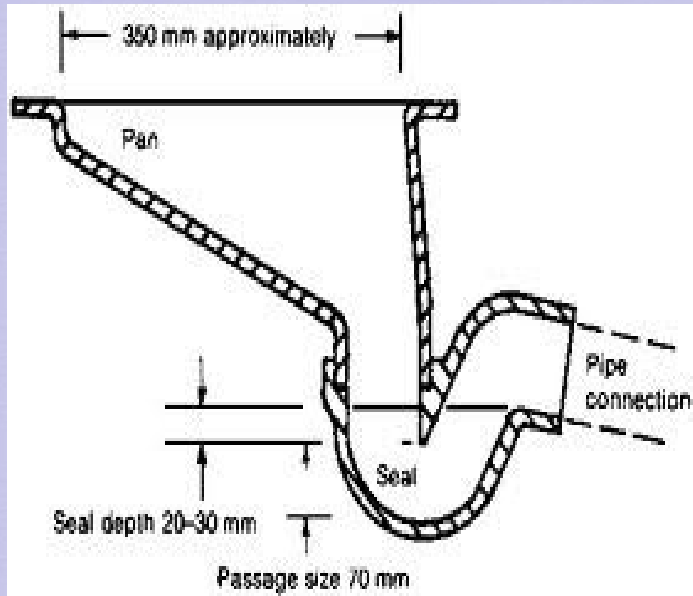
B. Sewered areas:

- a. Water carriage systems and sewage treatment plants.

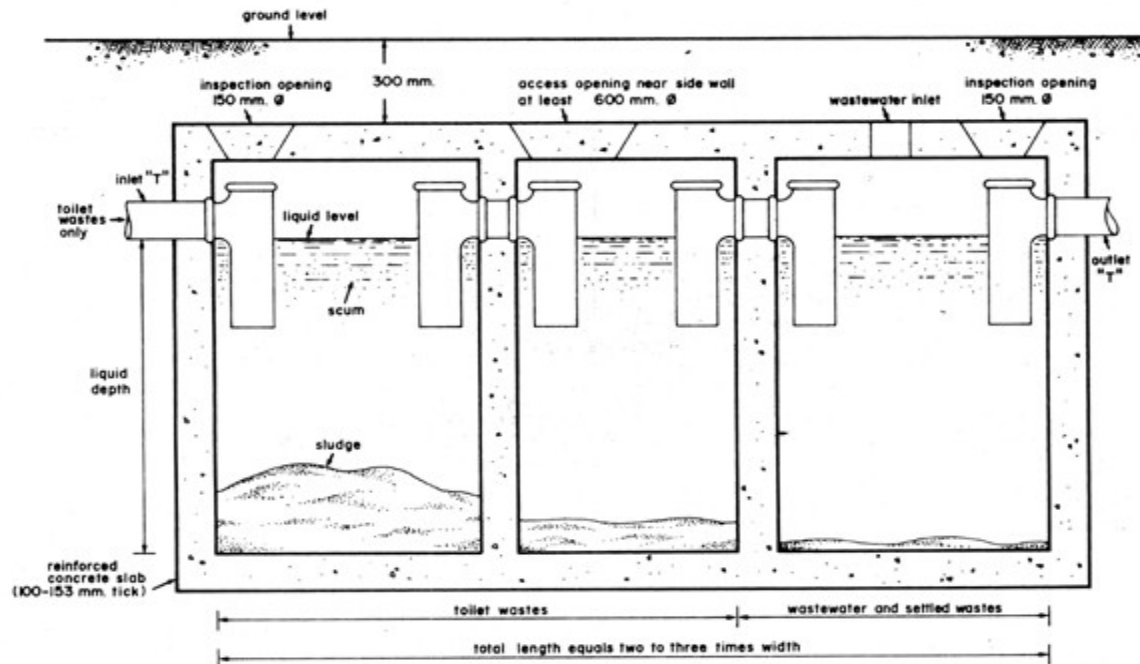
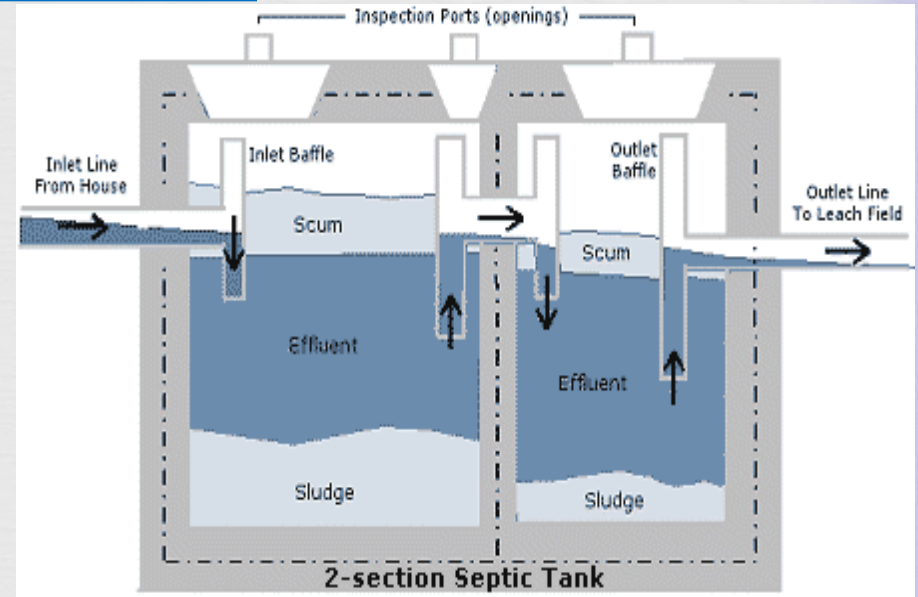
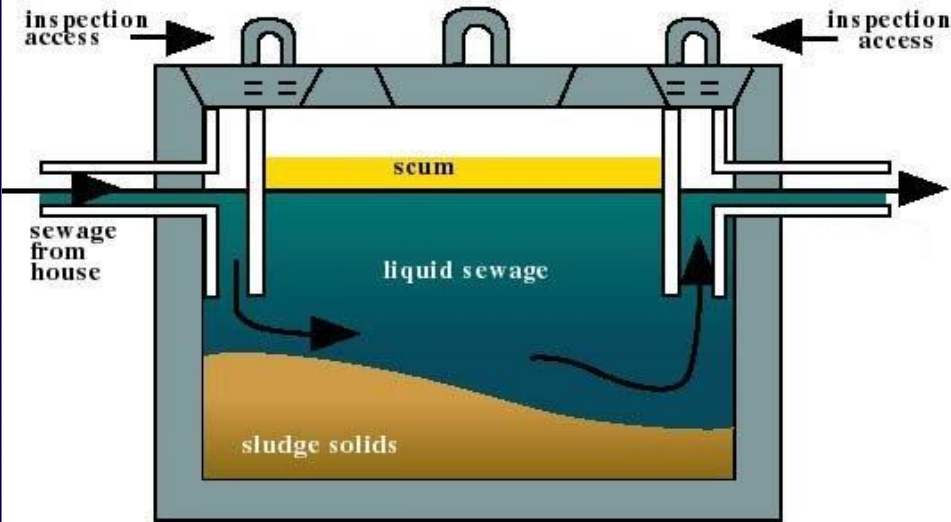
Water Seal (RCA Type) Latrine

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The constituent parts of water seal latrine are:

- a. Squatting plate
- b. Pan
- c. Trap
- d. Connecting pipe
- e. Dug well (pit)
- f. Superstructure



Septic Tanks



Thank You