

# Domestic Sewage

## Terminology:-

1. Refuse:- Rejected or left as worthless & for the study of sanitary engg.

(a) Garbage:- Dry refuse i.e., decayed fruits, grass, leaves, paper pieces, sweepings, vegetables etc.,

2. Sullage:- The wastewater from bathrooms, kitchens etc.,

3. Sewage:- Liquid waste from the community & it includes sullage, discharge from latrines, urinals, etc., industrial waste & storm water.

4. Combined sewage:- This indicates a combination of sanitary sewage & storm water with or without industrial waste.

5. Crude or Raw Sewage:- This indicates the sewage that is not treated.

6. Domestic or Sanitary Sewage:- Sewage mainly derived from residential or business buildings, institutions etc.,

7. Fresh Sewage:- The sewage which has been recently originated or produced.

8. Septic Sewage:- Sewage which is undergoing the treatment process.

9. Storm water:- Rainwater of the locality

10. Subsoil water:- Groundwater which finds its entry into sewer through leaks.

ii) Sewer:- Underground conduits or drains through which sewage is conveyed are known as "sewers".

11. Lateral sewer:- The sewer obtaining its discharge directly from buildings is known as "Lateral sewer".

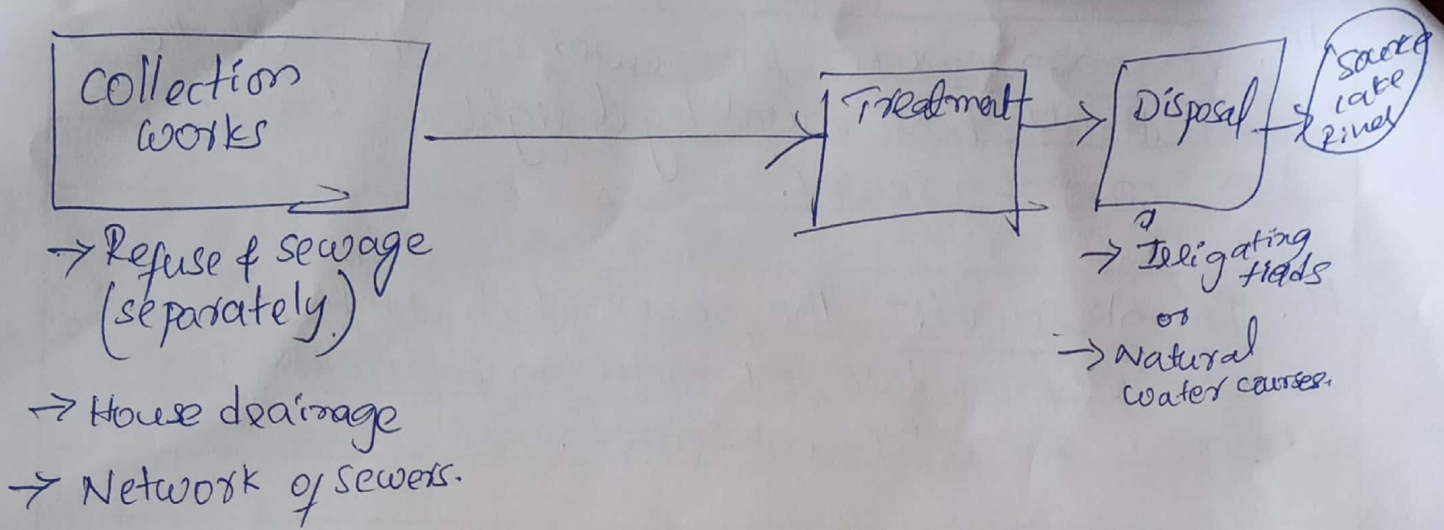
12. Main sewer:- The sewer which obtains its discharge ~~directly~~ from a few branch or sub-main sewers is known as "Main sewer".

13. Branch or sub-main sewer:- The sewer which obtains its discharge from a few laterals & delivers it to the main sewer is known as "Branch sewer".

14. combined sewer:- The sewer which carries domestic sewage & storm water is known as combined sewer.

15. Common Sewer:— The sewer on which all the inhabitants have equal legal rights is known as "common sewer".
16. Trunk sewer:— The sewer which obtains its discharge from two or more main sewers is known as a "Trunk sewer".
17. Depressed sewer:— When an obstruction or obstacle is met with, the sewer is constructed lower than the adjacent sections to overcome the obstruction or obstacle. Such a portion or section of sewer is known as "Depressed sewer".
18. Intercepting sewer:— The sewer which intercepts the discharge from a number of main or outfall sewer, & it carries the flow to the point of treatment & disposal.
19. Relief or overflow sewer:— The sewer which is meant to carry the excess discharge from an existing sewer is known as relief sewer.
20. Sewerage:— The entire science of collecting and carrying sewage by water carriage system through sewers is known as "sewerage".
21. Rubbish:— All sundry solid wastes as paper, broken furnitures, pottery, waste building materials etc., known as "Rubbish".

# Sanitary Works



## Methods of Sewage collection

1. Dry (or) conservancy system → Banned by Govt. of India
2. Water carriage system (Swachh Bharat Mission - Gramin)

### Conservancy system :-

- Practiced ~~was~~ from very ancient times.
- Now practising in very less remote villages.
- Garbage or Dry refuse → collected in dustbins placed along the roads & streets.
- (Non-combustible portions) sand, dust, clay ashes → used for filling low level areas for further development.

combustible portions are burnt.

Decaying fruits, vegetables, grass → 1<sup>st</sup> dried & then disposed of by burning in the manufacture of manure.

Human excreta or Night soil  $\Rightarrow$  collected separately.  
 $\rightarrow$  taken outside in closed trucks, tanks & buried in trenches.

~~Liquid & semi-liquid~~ ~~waste~~  $\Rightarrow$  collected in separate ~~bins~~

$\rightarrow$  After 2-3 years, the buried night soil is converted into excellent manure which can be used for growing crops.

Sulfage & storm  $H_2O$  allowed to mix with streams, rivers without any treatment.

### Water-Carriage System:

$\rightarrow$  collection & conveyance of the sewage.

$\rightarrow H_2O$  is the main substance.

$\rightarrow$  ~~Sewage~~ Human excreta is mixed with large quantity of water & carried through underground pipes.

$\rightarrow$  Latrines & ~~toilets~~ bath-rooms together called W.C (water-closets) (~~are~~ 99.9% of  $H_2O$  0.1% solid matter)

$\rightarrow$  All these solids remain in suspension in the sewage & do not change the sp. gr. of  $H_2O$  & all hydraulic formulae can be directly used in the designing of sewerage systems & the treatment plants.

## Components of sewerage systems:

1. A sewerage system consists of a network of sewer pipes laid to carry the sewage from individual homes to the sewage treatment plant.
2. Network of sewers
  - House sewers (Individual house connections)
  - Lateral sewers
  - Branch sewers
  - Main sewers (generally called trunk sewers)
  - Outfall sewer (sewer which transports sewage to the treatment plant)
  - Manholes ⇒ cleaning & inspection.
- ~~3. Pre-treatment~~
  - Catch basins ⇒ (Permit entrance of stormwater from street gutters).
3. The original contaminated sewage is not allowed to be discharged directly into the water source,
4. screening, sedimentation, biological filtration, sludge digestion, given so as to bring down its BOD concentrations to safer values, before discharging into natural river resource.

# Types of Sewerage systems:-

1. Combined system
2. Separate system
3. Partially separate system.

## Combined system:-

Sewers carrying both sanitary sewage & storm H<sub>2</sub>O.

→ Suitable for areas having small rainfall which is evenly distributed throughout the area bcoz at such places self-cleaning velocity will be available in every season.

→ Suitable in crowded areas.

→ Heavy rainfall for short time → ~~separate~~ <sup>combined</sup> system not suitable bcoz self-cleaning velocity not be available for most of the period.

Adv:- House plumbing can be done easily bcoz only one set of pipe will be req.

Disadv:- High initial cost.

## Separate system:-

TWO sewers

- Domestic & Industrial sewage (closed pipes)
- Storm & surface water. (open gutters)

Adv:- Cheaper than combined system.  
Economical design of treatment works.

~~NO fear of stream pollution~~  
Suitable for communities which receive heavy & high intensity storms. eg. Mumbai.

Dis-adv.

1. ~~less~~ No self-cleaning velocity available & flushing required at various points.
2. More maintenance cost.

### Partially Separate system

In the separate system, if a portion of storm water is allowed to enter in the sewers carrying sewage & the remaining storm water flows in separate set of sewers.

Adv :- Improvement over separate system.

- House-plumbing work is reduced, bcoz the rain - H<sub>2</sub>O from roof, sullage etc., can be taken in the same pipe carrying the discharge from the H<sub>2</sub>O closets. The H<sub>2</sub>O from all other places can be taken in separate sewer or drains.
- NO flushing is required.

Dis-adv :-

In Dry weather, the

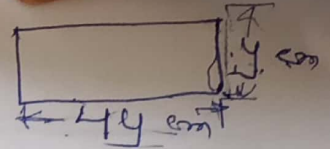


## Aims & Objects of Sewage - Disposal

1. Proper disposal of human excreta to a safe place before starts decomposition & may cause insanitary conditions in the locality.
  2. To take out all kinds of waste water from the locality, immediately after its production, so that mosquitoes, flies, bacteria etc., may not breed in it & cause nuisance.
  3. Finally sewage should be disposed in nearby water-courses or on land after some treatment. So that the land & water does not get pollute & unsafe for further use.
  4. As far as possible the fertilizing elements of sewage may be used in growing crops through sewage farming & getting some income in addition to the disposal of sewage.
- B. In unsewered areas, the treatment of sewage from individual houses, should be done by Septic tank or other suitable means & the effluent should be disposed of.
- b. If the sewage is disposed off on the land, it should have such a degree of treatment that it may not affect the sub-soil in any way

## Sources of Sanitary Sewage:-

1. Water supplied by local authority for domestic purposes, public places, schools, cinema, hotels, railways etc.
2. " drawn from well
3. ~~Water~~ Infiltration of groundwater into sewers through leaky joints.
4. Unauthorised entrance of rainwater in sewer lines.



## Additions due to infiltrations:-

- When the sewers are laid below the water table in the ground, the ground water may percolate in the sewers from the faulty joints & cracks in the pipelines.
- Quantity of infiltration water will depend upon the ht. of H<sub>2</sub>O table above the sewers invert, permeability of soil, size & nature of faults or cracks in the sewer line.
- Experiments done in USA. 2800 to 500,000 lit/day/km length of the sewer line.

Substractions Allowance :- The total quantity of water supplied by the water works does not enter the sewer lines due to the following reasons

1. The quantity of water used in drinking, after washing of clothes, quantity evaporated in drying, sprinkling is consumed & does not reach the sewers. Some quantity of water is lost.

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Page. No. \_\_\_\_\_

due to wastage leakage in the pipe line during distribution

So, the total allowance for subtraction in the total quantity of water supplied due to both the above reasons is taken between 20 to 30% of the total supply.

Quantity of sanitary  
sewage = 75 to 80% total quantity of  
water supplied