

## 4.1 TYPES OF SEWERAGE SYSTEMS

- 1) Separate system of sewage
- 2) Combined system of sewage
- 3) Partially combined or partially separate system

### SEPARATE SYSTEM OF SEWERAGE

In this system two sets of sewers are laid. The sanitary sewage is carried through sanitary sewers while the storm sewage is carried through storm sewers. The sewage is carried to the treatment plant and storm water is disposed of to the river.

Advantages:

- 1) Size of the sewers is small
- 2) Sewage load on treatment unit is less
- 3) Rivers are not polluted
- 4) Storm water can be discharged to rivers without treatment.

Disadvantage:

- 1) Sewerage being small, difficulty in cleaning them
- 2) Frequent choking problem will be their.
- 3) System proves costly as it involves two sets of sewers
- 4) The use of storm sewer is only partial because in dry season the will be converted into dumping places and may get clogged.

### COMBINED SYSTEM OF SEWAGE

When only one set of sewers are used to carry both sanitary sewage and surface water. This system is called combined system.

Sewage and storm water both are carried to the treatment plant through combined sewers.

Advantages:

- 1) Size of the sewers being large, choking problems are less and easy to clean.
- 2) It proves economical as 1 set of sewers are laid.
- 3) Because of dilution of sanitary sewage with storm water nuisance potential is reduced

Disadvantages:

- 1) Size of the sewers being large, difficulty in handling and transportation.
- 2) Load on treatment plant is unnecessarily increased

- 3) It is uneconomical if pumping is needed because of large amount of combined flow.
- 4) Unnecessarily storm water is polluted

### **PARTIALLY COMINED OR PARTIALLY SEPARATE SYSTEM**

A portion of storm water during rain is allowed to enter sanitary sewer to treatment plants while the remaining storm water is carried through open drains to the point of disposal.

Advantages:

- 1) The sizes of sewers are not very large as some portion of storm water is carried through open drains.
- 2) Combines the advantages of both the previous systems.
- 3) Silting problem is completely eliminated

Disadvantages:

- 1) During dry weather, the velocity of flow may be low.
- 2) The storm water is unnecessary put load on to the treatment plants to extend.

#### **Suitable conditions for separate sewerage systems:**

A separate system would be suitable for use under the following situations:

1. Where rainfall is uneven.
2. Where sanitary sewage is to be pumped.
3. The drainage area is steep, allowing to runoff quickly.
4. Sewers are to be constructed in rocky strata.
5. The large combined sewers would be more expensive.

#### **Suitable conditions for combined system:**

1. Rainfall in even throughout the year.
2. Both the sanitary sewage and the storm water have to be pumped.
3. The area to be severed is heavily built up and space for laying two sets of pipes is not enough.
4. Effective or quicker flows have to be provided.

After studying the advantages and disadvantages of both the systems, present day construction of sewers is largely confined to the separate systems except in those cities where combined system already exists. In places where rainfall is confined to one season of the year, like India and even in temperate regions, separate system is most suitable.

Sl. no.	Separate system	Combined system
1.	The quantity of sewage to be treated is less, because no treatment of storm water is done.	As the treatments of both are done, the treatment is costly.
2.	In the cities of more rainfall this system is more suitable.	In the cities of less rainfall this system is suitable.
3.	As two sets of sewer lines are to laid, this system is cheaper because sewage is carried in underground sewers and storm	Overall construction cost is higher than separate system.
4.	In narrow streets, it is difficult to use this system.	It is more suitable in narrow streets.
5.	Less degree of sanitation is achieved in this system, as storm water is disposed without any treatment.	High degree of sanitation is achieved in this system.

### Methods of domestic waste water disposal:

After the waste water is treated it is disposed in the nature in the following two principal methods

- a. Disposal by Dilution where large receiving water bodies area available
- b. Land disposal where sufficient land is available

The choice of method of disposal depends on many factors and is discussed later. Sanitary engineering starts at the point where water supply engineering ends. It can be classified as

- Collection works
- Treatment works
- Disposal works
- The collection consists of collecting all types of waste products of town. Refuse is collected separately. The collection works should be such that waste matters can be transported quickly and steadily to the treatment works. The system employed should be self-cleaning and economical.
- Treatment is required to treat the sewage before disposal so that it may not pollute the atmosphere & the water body in which it will be disposed of. The type of treatment processes depends on the nature of the waste water characteristics and hygiene, aesthetics and economical aspects.
- The treated water is disposed of in various ways by irrigating fields or discharging in to natural water courses.

### 4.1.1 SEWAGE TYPES

- 1) Conservancy System
- 2) Water Carriage System

#### **CONSERVENCY SYSTEM:**

Sometimes the system is also called as dry system. This is out of date system but is prevailing in small towns and villages. Various types of refuse and storm water are collected conveyed and disposed of separately. Garbage is collected in dustbins placed along the roads from where it is conveyed by trucks ones or twice a day to the point of disposal. all the non-combustible portion of garbage such as sand dust clay etc are used for filling the low level areas to reclaim land for the future development of the town. The combustible portion of the garbage is burnt. The decaying matters are dried and disposed of by burning or the manufacture of manure.

Human excreta are collected separately in conservancy latrines. The liquid and semi liquid wastes are collected separately after removal of night soil it is taken outside the town in trucks and buried in trenches. After 2-3 years the buried night soil is converted into excellent manure. In conservancy system sullage and storm water are carried separately in closed drains to the point of disposal where they are allowed to mix with river water without treatment.

#### **WATER CARRIAGE SYSTEM**

With development and advancement of the cities urgent need was felt to replace conservancy system with some more improved type of system in which human agency should not be used for the collection and conveyance of sewage. After large number of experiments it was found that the water is the only cheapest substance which can be easily used for the collection and conveyance of sewage. As in this system water is the main substance therefore it is called as water carriage system.

In this system the excremental matter is mixed up in large quantity of water their taken out from the city through properly designed sewerage systems, where they are disposed of after necessary treatment in a satisfactory manner.

The sewages so formed in water carriage system consist of 99.9% of water and .1% solids. All these solids remain in suspension and do not changes the specific gravity of water therefore all the hydraulic formulae can be directly used in the design of sewerage system and treatment plants.

## Difference between Conservancy system and Water carriage system:

CONSERVANCY SYSTEM	WATER CARRIAGE SYSTEM
Very cheap in initial cost.	It involves high initial cost.
Due to foul smells from the latrines, they are to be constructed away from living room so building cannot be constructed as compact units.	As there are no foul smell latrines remain clean and neat and hence are constructed with rooms, therefore buildings may be compact.
The aesthetic appearance of the city cannot be improved	Good aesthetic appearance of city can be obtained.
For burial of excremental matter large area is required.	Less area is required as compared to conservancy system.
Excreta is not removed immediately hence its decomposition starts before removal.	Excreta are removed immediately with water, no problem of foul smell or hygienic trouble.
This system is fully depended on human agency .In case of strike by the sweepers; there is danger of insanitary conditions in	As no human agency is involved in this system ,there is no such problem as in case of conservancy system

