

Wastewater Engineering

Lecture - 5



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Sewerage System (Part-1)

Lecture Content

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Introduction

- **Sewage:** Sewage is the municipal wastewater including domestic sewage, storm water and infiltrated ground water entering the sewerage system.
- **Sewerage:** A sewerage is a system for the collection and conveyance / carriage of municipal wastewater to the wastewater treatment plant or to the point of disposal. Sewerage system comprised of various sewers.
- **Sewer:** Sewer is any conduit or pipe used for carrying the sewage. Sewers generally carry sewage by gravity.

Types of Sewers (Materials)

1) Asbestos cement



2) Ductile Iron



3) Reinforced Concrete



Types of Sewers (Materials)

4) PVC Sewer



5) Clay made Sewer



Types of Sewers (Function)

- **Sewers** can be classified into the following types with respect to their functions:
 - 1. Building sewers/building connections:** It begins beyond a building foundation, conveying sewage from the building to lateral sewer.
 - 2. Lateral / branch sewer:** It receives sewage from building sewers and conveys to main sewers.
 - 3. Main sewer:** It receives sewage from lateral sewers and conveys to trunk sewers or intercepting sewers.

Types of Sewers (Function)

- 4. Trunk sewers:** These are large sewers conveying sewage from main sewers to sewage treatment plant (STP) or disposal facilities or to large intercepting sewers.
- 5. Intercepting sewers:** These are also large sewers used to intercept a number of main or trunk sewers and convey sewage to STP/disposal facilities.

Types of Sewers (Function)

- Lateral sewers are sized larger than the building sewers.
- Building sewers are either 100 or 150 mm size and 150 mm is the recommended minimum size for a gravity sewer.
- Flow in sewers is considered as steady and uniform
- A sewer has to carry peak flow and transport suspended solids with minimum of deposition in sewers.
- There should be non-silting velocity in sewers to avoid blocking of sewers.

Types of Sewerage System

➤ There are three systems of sewerage adopted in practice:

1. Combined system

2. Separate system

3. Partially separate system

1) Combined Sewerage System

- When both sanitary sewage and storm water are carried in a single sewer, it is called a combined sewerage system.
- When the flow in a combined sewerage system consist of only domestic sewage without storm water, flow is called '**DRY WEATHER FLOW**'

1) Combined Sewerage System

Advantages:

1. Both domestic sewage and storm water are carried in a single sewer, so construction cost is less.
2. The strength of domestic sewage is reduced because of dilution of storm water.
3. The sewers are of large size, and therefore the chances of their chocking are rare. It is easy to clean them.
4. In towns with narrow streets, this system is preferred.

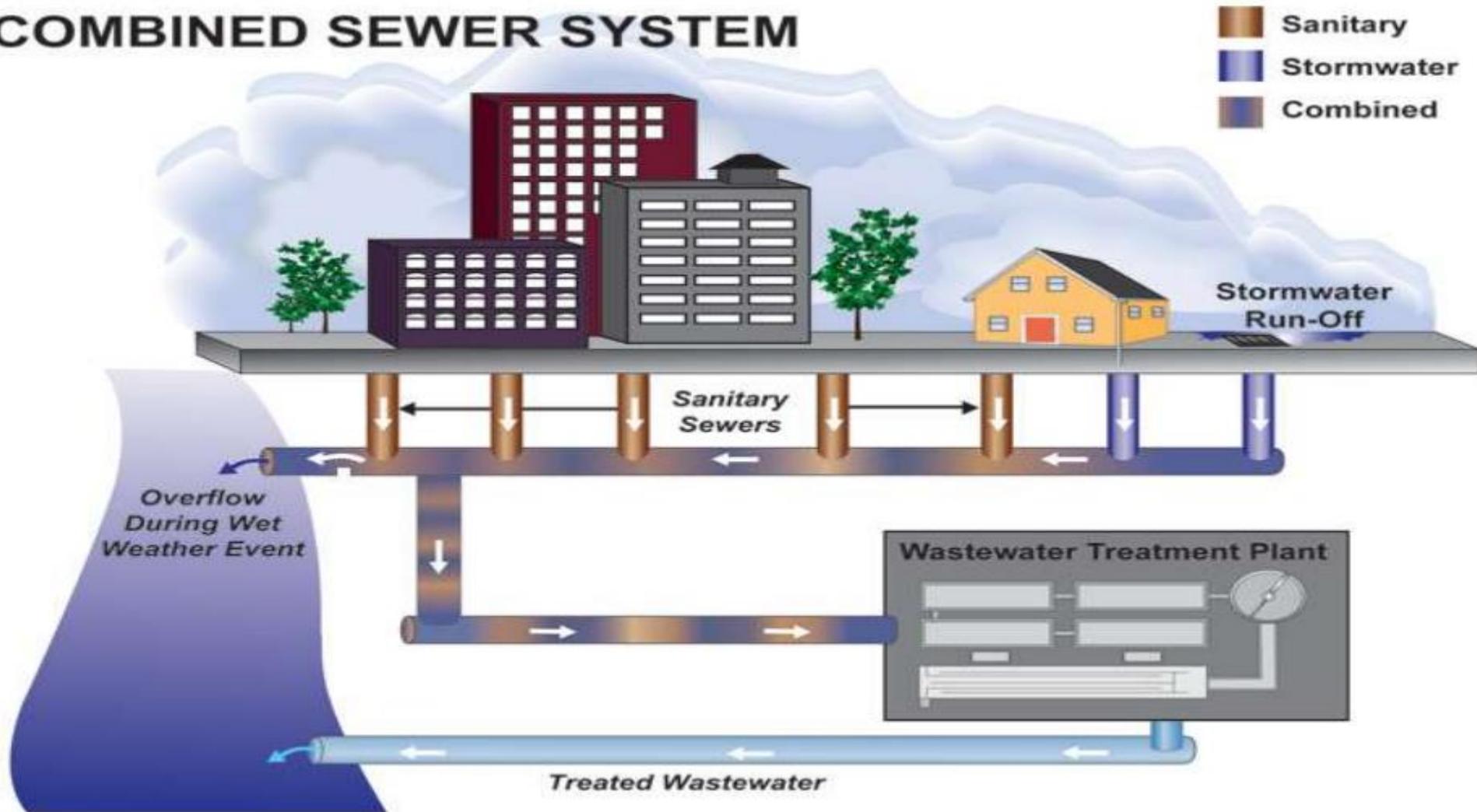
1) Combined Sewerage System

Disadvantages:

1. Initial cost is high because of large dimensions of sewers.
2. Because of large size of sewer, their handling and transportation is difficult.
3. Due to the inclusion of storm water, the load on the treatment plant increases and ultimately increases treatment costs.
4. During heavy rain the sewer may be overflow and may thus create unhygienic conditions.
5. If the whole sewage is to be disposed off by pumping it is uneconomical.

1) Combined Sewerage System

COMBINED SEWER SYSTEM



2) Separate Sewerage System

- In this system two separate sets of sewers are installed, one for collection and conveyance of **sanitary sewage** and other for **storm water**.
- As storm water is carried separately, it does not contaminate nature and normally disposed off to natural water course / streams without any treatment.
- Where as the sanitary sewage is taken to treatment plant separately, so there is less load on treatment plant thus reducing treatment costs.

2) Separate Sewerage System

Advantages:

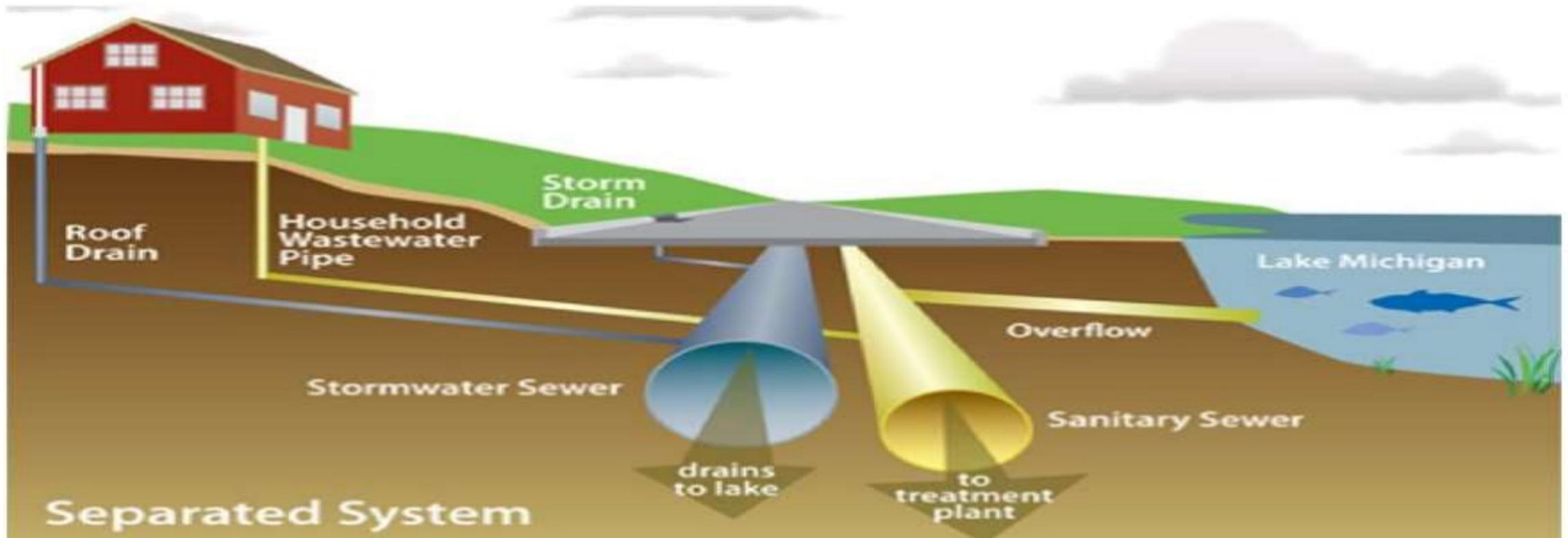
1. Size of sewers is generally less.
2. Since the sanitary sewage and storm water flows in a separate pipes, the quantity of sewage to be treated is less.
3. As the sewer are smaller in section, they can be easily ventilated.
4. Rain water can be discharged in to the streams or can be reused / recycled without any treatment.

2) Separate Sewerage System

Disadvantages:

1. Since the sewers are of smaller size, it is difficult to clean them.
2. They are likely to get choked / blocked.
3. Initial cost is high, when two separate sets are used.
4. Maintenance cost of system is also high.

2) Separate Sewerage System



3) Partially Separate Sewerage System

- In this system, only one set of underground sewer is laid.
- These sewers admit the sanitary sewage as well as the early washings from the drainage area due to rains.
- When the storm water exceeds its specified limit, the excess water is diverted into natural water courses / streams.

3) Partially Separate Sewerage System

Advantages:

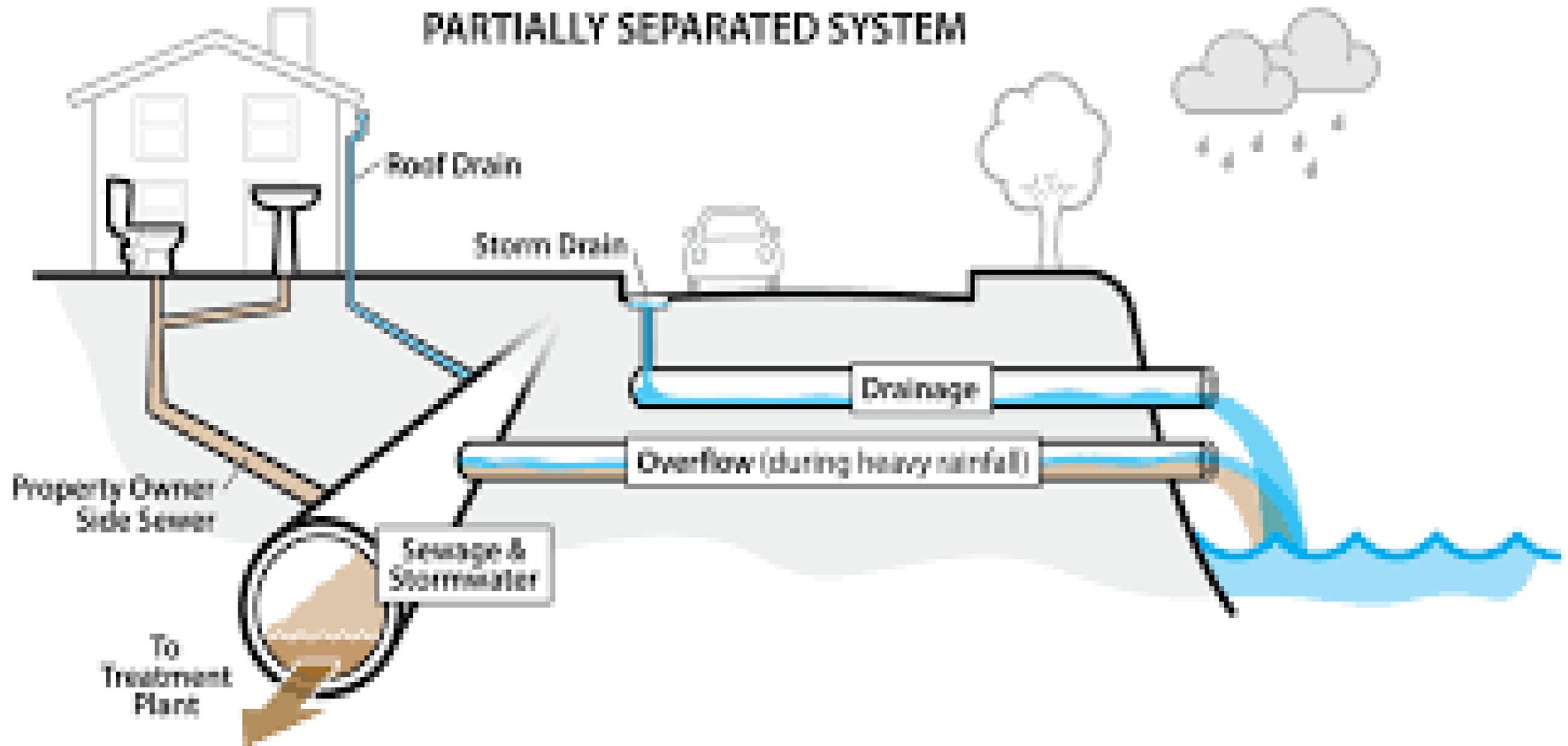
1. The sewers are of reasonable size. Their cleaning is therefore not difficult.
2. It combines the advantages of both the separate as well as the combined systems.

3) Partially Separate Sewerage System

Disadvantages:

1. During dry weather silt deposition may take place in sewers.
2. As initial storm water is included the costs of pumping and size of disposal units increase.
3. The storm water increase the load on treatment plant.
4. There are possibilities of overflow in case of high intensity rains.

3) Partially Separate Sewerage System



Thank You