

**QUANTITY ESTIMATION OF SEWAGE**

**Introduction**

The sewage collected from the municipal area consists of wastewater generated from the residences, commercial centers, recreational activities, institutions and industrial wastewaters discharge in to sewer network from the permissible industries located within the city limits.

Before designing the sewer, it is necessary to know the discharge i.e., quantity of sewage, which will flow in it after completion of the project.

Accurate estimation of sewage discharge is necessary for hydraulic design of the sewers. Far lower estimation than reality will soon lead to inadequate sewer size after commissioning of the scheme or the sewers may not remain adequate for the entire design period. Similarly, very high discharge estimated will lead to larger sewer size affecting economy of the sewerage scheme, and the lower discharge actually flowing in the sewer may not meet the criteria of the self-cleansing velocity and hence leading to deposition in the sewers. Actual measurement of the discharge is not possible if the sewers do not exist; and where the capacity of the existing sewers is inadequate and need to be increased, still actual present discharge measurement may not be accurate due to unaccounted overflow and leakages that might be occurring in the existing system. Since sewers are design to serve for some more future years, engineering skills have to be used to accurately estimate the sewage discharge.

**Sources of Sanitary Sewage**

1. Water supplied by water authority for domestic usage, after desired use is discharged in to sewers as sewage.

2. Water supplied to the various industries for various industrial processes by local authority. Some quantity of this water after use in different industrial applications is discharged as wastewater.

3.The water supplied to the various public places such as, schools, cinema theaters, hotels, hospitals, and commercial complexes. Part of this water after desired use joins sewers as waste water.

4. Water drawn from wells by individuals to fulfil domestic demand. After uses this water is discharged in to sewers.

5. The water drawn for various purposes by industries, from individual water sources such as, wells, tube wells, lake, river, etc. Fraction of this water is converted in to wastewater in different industrial processes or used for public utilities within the industry generate wastewater. This is discharged in to sewers.

6. Infiltration of ground water into sewers through leaky joints.

7. Entrance of rainwater in sewer lines during rainy season through faulty joints or cracks in sewers.

**Dry Weather Flow**

Dry weather flow is the flow that occurs in sewers in separate sewage system or the flow that occurs during dry seasons in combined system. This flow indicates the flow of sanitary sewage. This depend upon the rate of water supply, type of area served, economic conditions of the people, weather conditions and infiltration of ground water in the sewers, if sewers are laid below ground water table.

**Evaluation of Sewage Discharge**

Correct estimation of sewage discharge is necessary; otherwise sewers may prove inadequate resulting in overflow or may prove too large in diameter, which may make the system uneconomical and hydraulically inefficient. Hence, before designing the sewerage system it is important to know the discharge / quantity of the sewage, which will flow in it after completion of the project and at the end of design period.

Apart from *accounted water supplied* by water authority that will be converted to wastewater, following quantities are considered while estimating the sewage quantity:

**a. Addition due to unaccounted private water supplies**

People using water supply from private wells, tube wells, etc. contribute to the wastewater generation more than the water supplied by municipal authority. Similarly, certain industries utilize their own source of water. Part of this water after desired uses is converted into wastewater and ultimately discharged in to sewers. This quantity can be estimated by actual field observations.

**b. Addition due to infiltration**

This is additional quantity due to groundwater seepage in to sewers through faulty joints or cracks formed in the pipes. The quantity of the water depends upon the height of the water table above the sewer invert level. If water table is well below the sewer invert level, the infiltration can occur only after rain when water is moving down through soil. The quantity of the water entering sewers depends upon the permeability of the ground soil and it is very difficult to estimate. While estimating the