LAKSHMI NARAIN COLLEGE OF TECHNOLOGY

BHOPAL

(CIVIL ENGNEERING DEPARTMENT)

Environmental Engineering (CE-602)

Unit : IV

Topic : Storm water and Fluctuations in sewage flow

Prepare By : Dr. Anil K. Saxena

Storm Water

The quantity of storm water, which is known as the wet weather flow and is to be collected and conveyed in sewers at proper places for the following reasons:

- The damp conditions are created which are unhygienic as they provide flourishing ground for micro-organisms.
- The existence of water pools affects the foundations of structures.
- The initial washings of streets by storm water contain organic matter and hence, such water requires to be collected and to be taken to the treatment plant.
- The low lying areas get flooded and transport system is paralyzed. It leads to the loss of revenue.
- The stagnant water pools serve as the breeding places for the mosquitoes.

Storm Water

Following two methods are generally employed for calculating the quantity of storm water for the purpose of designing sewers:

(1) Rational method

$Q = K \ A \ / \ R$

Q = Runoff in Cumec

A = Area in hectares

R = Intensity of rainfall in mm per hour

Storm Water (Cont

(2) Empirical formulas.

- In this method catchment area, rate of intensity of rainfall, relative imperviousness and slope of ground are considered
- Above factors employed in various emphirical relations for calculations of storm water

Dry Weather Flow

It is that quantity of wastewater that flows through as sewer in dry weather when no storm water is in the sewer. The dry weather flow is also sometimes called as ‘sanitary sewage’, and is obtained from the following sources:

- A certain quantity of water is being supplied daily by the Water Works Department, for domestic use. This water gets consumed in various ways, and therefore all of it does not reach the sewer.
- Industrial wastewater is generated by the industry after consuming water for its manufacturing processes.
- Waste water from schools, cinemas, hotels, railway stations street washings.
- Ground water infiltration that sewers, nature and condition of sewer joints, depth of sewer and position of water table.

Dry Weather Flow

Factors Affecting Dry Weather Flow

1. Rate of water supply.
2. Population growth.
3. Type of area served
4. Infiltration of ground water

Quantity of the sewa

The average sewer never flows in the sewers; it continuously varies from hour to hour of the day and season to season. The design of the sewers should be done for the maximum possible flow which would ever pass through in worst possible case.

(i)The seasonal maximum rate of flow may be taken as the 1.3 times of average daily combined system rate of flow

(ii)The monthly maximum rate of flow may be taken as the 1.4 times the average rate of flow

(iii)The daily maximum rate of flow may be taken as the 1.8 times or so the average daily rate of flow.

Quantity of the sew

Factors for Variations of Sewage

- The variations are due to habits of people climatic conditions, types of industries, level of ground water, fluctuations in the activities of factories, etc.
- The composition of water in summer is more than in winter or rainy season, and this change in consumption of water directly affects the quantity of sewage.
- There is also change in the sewage quantity if the city has seasonal industries such as sugarcane crushing, fruit canning, brewing etc.
- The quantity of sewage can also change from day to day. On the closing days of market, offices, industries, the quantity of sewage shall be more due to cloths washing, house washing etc.

Contd…

- The variation in the sewage quantity also depends on the local conditions
- The strength of domestic sewage is reduced because of dilution of storm water
- Every city possesses peculiarities of its own and hence, before arriving at a particular decision the detailed studies become essential.
- The variation in rate of sewage affects the design of sewers. The tow controlling factors in the design of a sewer are the maximum and minimum rates of sewage.
- The sewer is to be designed to carry the maximum discharge and at the same time, it should be laid at such a gradient that silting will not occur during the period of minimum flow of sewage.

Contd…

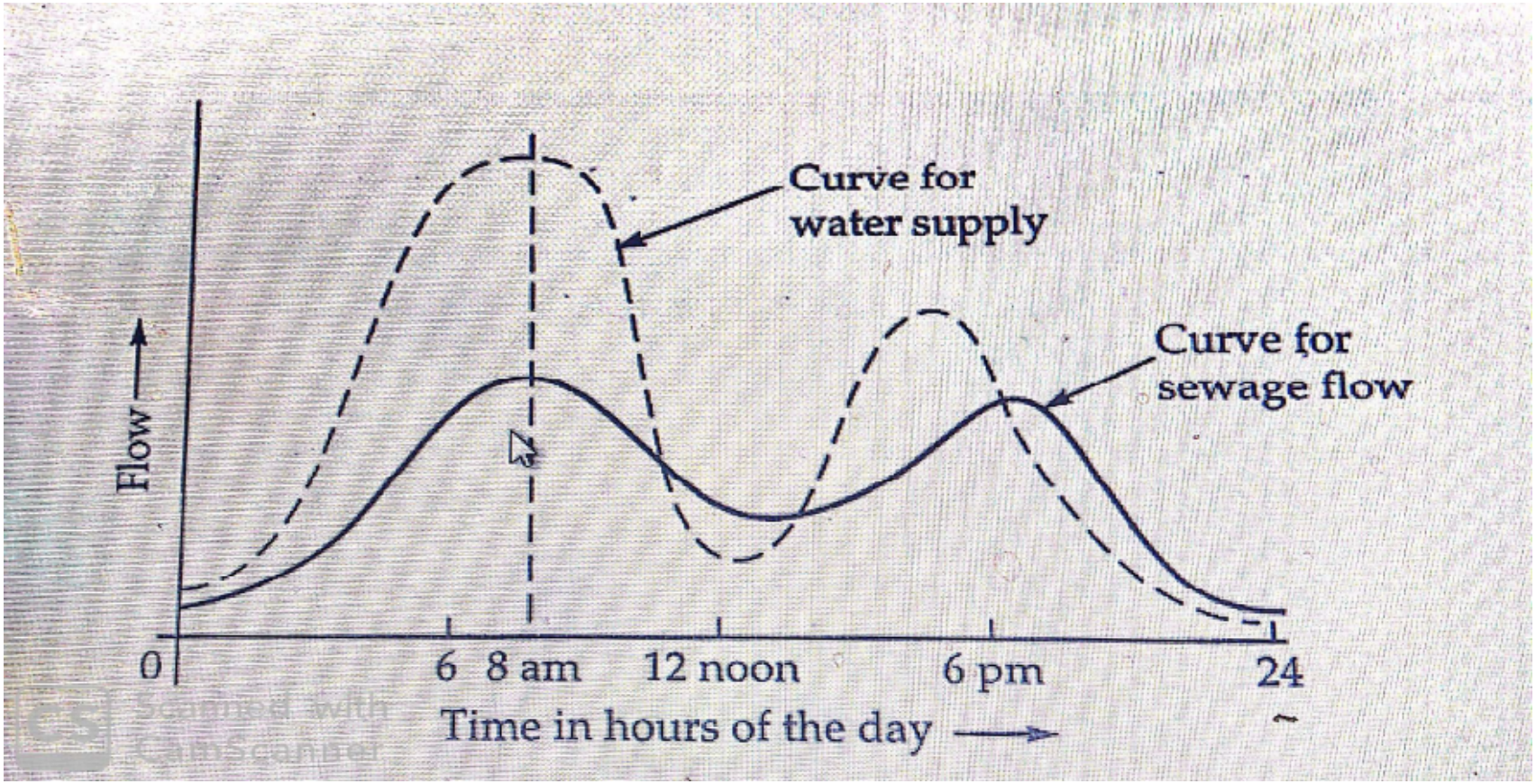
- The variations between maximum, average and minimum rates of flow of sewage are sometimes great and a compromise is to be found out by selecting a suitable multiplying factor. Every case is to be studied separately before recommending a particular multiplying factor.
- Under normal conditions,

  This factor for laterals sewer is 4;

  For main, trunk and outfall sewers is 2.50;

  For combined sewers is 2.

  The peak sewage flow has also been connected with the population by the following equation:



Hourly variation of sewage flow