

### Para 3.4.3 Velocities

The flow in sewers varies widely from hour to hour and also seasonally, but for purpose of hydraulic design, it is estimated peak flow that is adopted. However it is to be ensured that a minimum velocity is maintained in the sewers even during minimum flow conditions. At the same time the velocity should not be excessive to cause erosion.

#### 3.4.3.1 Velocity at Minimum Flow

It is necessary to size the sewer to have adequate capacity for the peak flow to be achieved at the end of design periods, so as to avoid steeper gradients and deeper excavations. It is desirable to design sewers for higher velocities wherever possible. This is done on the assumption that although silting might occur at minimum flow, the silt would be flushed out during the peak flows. However the problem of silting may be faced in the early years particularly for smaller sewers which are designed to flow part full at the end of design period, where depth of flow during early years is only a small fraction of the full depth. Similarly upper reaches of laterals pose a problem as they flow only partly full even at the ultimate design flow, because of necessity of adopting the prescribed minimum size of sewer. In such situations flushing arrangements may be provided in the initial years.

In the design of sanitary sewer an attempt should be made to obtain adequate scouring velocities at the average or at least at the maximum flow at the beginning of the design period. It has been shown that for sewers running partially full, for a given flow and slope, velocity is little influenced by pipe diameter. It is therefore recommended that for present peak flow upto 30lps, the slopes given in table below may be adopted which would ensure a minimum velocity of 0.60 mps in the early years..

Table 3.7 Recommended Slopes for Minimum Velocity

Present peak flow in lps	Slope per 1,000
2	6.0
3	4.0
5	3.1
10	2.0
15	1.3
20	1.2
30	1.0

After arriving at slope for present peak flows, the pipe size should be decided on the basis of ultimate design peak flow and the permissible depth of flow. The minimum diameter for a public sewer may be 150mm. However the minimum size in hilly areas, where extreme slopes are prevalent may be 100mm

#### **3.4.3.2 Erosion and Maximum Velocity**

Erosion of sewers is caused by sand and other gritty material in the sewer and also by excessive velocity. Velocity in a sewer is recommended not to exceed 3.0 mps.