CHAPTER 5
DRAINAGE DESIGN

5.1 General

Nanded city receives rainfall of 901 mm. The city roads have at present side drains, which are inadequate for carrying the discharge. The Storm water drain system has not so far been designed for the city as revealed during the discussions with the Corporation Authorities.

5.2 Data Collection

The data is acquired from following sources:

- Topographic sheet of the project area as published by the Survey Of India Department.
- Rainfall maps
- IRC- SP42, SP-50
- General condition of soil, strata and its permeability
- Alignment and profile of the drain & the roads

5.3 Design Basis

The drainage system is designed to cater for the water inflow, which consists of following parts:

5.3.1 Surface runoff generated due to the rainfall

This is the runoff, which can find its way into the drain drains depending upon the road alignment & drain profiles. As per the recommendations of IRC SP 42, it is necessary to consider design rainfall of 50 year return period for specific time of concentration.

The longitudinal profile of the pavement within the drain indicates the pavement has a highest elevation around chainage 1700, sloping on either side. This prevents the drain from receiving any runoff generated from the road stretches beyond the drain. Hence this surface runoff is calculated only for the road stretches on either side of the drain as well discharged from adjoining properties.

Since the governing catchment area is not exceeding 50 sq km, the runoff generated is calculated using Rational Formula, which is:

Q= 0.028 X P X A X Ic

Where,

Q is peak run off in cum / sec
P is coefficient of runoff
A is catchment area in hectare
Ic is design rainfall intensity in cm/hr for specific time of concentration

The time of concentration for the design of roadside drain consists of two parts:

Time of inlet; is the time required by runoff to reach the drain from the farthest point in catchment.

Time of flow; is the time required by runoff to flow through the drain.

5.3.2 Water spilled from fire fighting

As per the International Standards, this is taken as 66 litre per sec, when two fire tenders are operated.

5.3.3 Ground water which gets percolated

Quantity of ground water flowing into the drain is dependent on the ground conditions, the design & constructional quality of the drain structure.

5.3.4 Sizing of the Drain Section

The drains proposed within the drain are rectangular channels and will be provided on either side. The road beyond drain on the south side is also proposed to be provided with rectangular sections. The road length on the North side will be provided with trapezoidal section due to availability of space. Pipes are proposed only at alignment crossing. Both these sections are designed using Manning's equation, which is as follows:

$$V = 1/n\,(R)^{2/3} \times (S)^{1/2}$$

$$Q = A \times V$$

Where,

V is velocity through drain in m/s
n is roughness coefficient

R is hydraulic mean depth, which is ratio of area to wetted perimeter
S is gradient
A is area of cross section of drain in Sqm
Q is the drain capacity in cubm /s

The proposed sketch of the side drain is shown in **Annexure-5.1.**