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## Design of Road Side Drainage

\* Mehul I. Patel Prof. \*\*N.G.Raval

\* A/41, Shrinath park Soc. Near-Jogeshwari Soc. Amraiwadi, Ahmedabad

\*\* L.D. Engineering College, Ahmedabad Gujarat, India

### ABSTRACT

*Provision of sufficient drainage is an important factor in the location and geometric design of highways. Drainage facilities on any highway or street should be adequately provided for the flow of water away from the surface of the pavement to properly designed channels. Inadequate drainage will eventually result in serious damage to the highway structure. In addition, traffic may be slowed by accumulated water on the pavement, and accidents may occur as a result of hydroplaning and loss of visibility from splash and spray.*

*The highway engineer is concerned primarily with two sources of water. The first, surface water which occurs as rain or snow. Some of this is absorbed into the soil, and the remainder remains on the surface of the ground and should be removed from the highway pavement. Drainage for this source of water is referred to as surface drainage. The second source is ground water which flows in underground streams. This may become important in highway cuts or at locations where a high water table exists near the pavement structure. Drainage for this source is referred to as subsurface drainage.*

### 1. INTRODUCTION

Drainage is the process of interception and removal of water from over, and under the vicinity of the road surface. Drainage can be surface (where water is conveyed on the road surface and drainage channels), or subsurface (water flows underneath the pavement structure). Surface and subsurface drainage of roads critically affects their structural integrity, life and safety to users, and is thus important during highway design and construction. Road designs therefore have to provide efficient means for removal of this water; hence the need for road drainage designs. Drainage facilities are required to protect the road against damage from surface and sub-surface water. Traffic safety is also important as poor drainage can result in dangerous conditions like hydroplaning. Poor drainage can also compromise the structural integrity and life of a pavement. Drainage systems combine various natural and manmade facilities e.g. ditch, pipes, culverts, curbs to convey this water safely. Drainage is an essential component in the pavement's good mechanical behavior and thus makes a significant contribution to the durability of road structures.

### 2. EFFECTS OF IMPROPER DRAINAGE

One of the major causes of road failure is its improper drainage facilities. Improper drainage of the road causes destruction in the following ways:

- Road surface if made of soil, gravel or water bound macadam, it will become soft and losses strength.
- The road sub-grade may be softened and its bearing capacity reduced.
- Variation in moisture content in expensive soils causes variation in the volume of sub-grade and thus causes failure of roads.
- Failure of formation slopes is also attributed to poor drainage.
- If rain water is not properly drained and allowed to flow along the road side for long distances, slip and land slides may occur causing road failures.
- Erosion of side slopes, side drains, and formation of gullies may result if proper drainage conditions are not maintained.
- Flexible pavement's failure by formation of waves and

corrugations is due to poor drainage.

- Continuous contact of water, with bituminous pavements causes failures due to stripping of bitumen from aggregates like loosening or detachment of some of the bituminous pavement layers and formation of pot holes.

### 3. The good highway drainage should fulfill the following requirements.

- Surface water should not be allowed to remain standing on the road pavement and shoulders.
- The surface rain water from the adjoining area should not be allowed to come towards the road surface
- Side drains should be of sufficient capacity and having sufficient longitudinal slope so that it may drain of all the collected surface water, efficiently.
- Surface water flowing across the road pavement should not develop cross ruts or erosions on road surface and shoulders
- Seepage water and other capillary waters should be drained off by suitable underground drainage system.
- Maximum level of underground water table should be maintained well below the sub-grade level of the road. Under ground water table should remain at least 1 m to 2 m below the road sub-grade.
- In water logged areas, special measures should be taken to keep down the harmful salts.

### 4. STUDY AREA

The state highway-41 is the one of the most important highway which is connected with Ahmedabad to Delhi via Jaipur. Mehsana city is 76 km away from Ahmedabad located on State Highway-41. The Highway Drainage facilities is to be designed from chainage 78/00 to 79/00 on state highway-41. The length of the stretch is two kilometer.



$$S = [0.04 * 1.5 / (0.25)^{2/3}]$$

$$S = 0.151$$

Therefore, the proposed slope for the side drainage is 1 in 6.5.

## 7. CONCLUSION

The Paper required design of a suitable drainage system.

Analysis provided the following data.

- Design Intensity: - 314.3mm/hr.
- Discharge:- 0.70 m<sup>3</sup>/sec

The discharge above was used in the design of the drainage channel. The dimension produced is feasible and can be used for construction.

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