

# Study on Flexible Pavement Failures and its Remedial Measures

Er. Neeraj Kumar<sup>1</sup>, Mr. Murli Dhar<sup>2</sup>

<sup>1</sup>Associate Professor & head of department of Civil Engineering Affiliated with KU Kurukshetra Haryana

<sup>2</sup>M.tech scholar of department of Civil Engineering Affiliated with KU Kurukshetra Haryana

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**Abstract** - Pavements form the basic supporting structure in highway transportation. Each layer of pavement has a multitude of functions to perform which has to be duly considered during the design process. The condition of pavement is not good enough so that it requires some maintenance and rehabilitation. Road length of 24 kms from Shahbad to Saha (NH-444a) highway connecting shahbad town and several others with the main cities. The nearby area is mostly agricultural land and remains irrigated throughout the year. Many factories, marriage halls, colleges and residential areas are existing on the stretch, so the traffic volume will increase year by year. There are many college buses, loaded trucks, tractors, public transport travelling 24 hours on the length of road. So the pavement condition shall deteriorate under failing circumstances and unsafe for road users due to heavy traffic.

## 1. INTRODUCTION

Transportation infrastructure plays a lead role in economic growth and development of country. India has the second largest highway and road network system in the world. They carry almost 90 percent passenger traffic of our country and 65 percent of freight. Most highways in India are narrow and congested with poor surface quality. Though highways are well designed as well as properly constructed but still it may require maintenance, the extent which will depend on several factors including the pavement type. The functional deterioration is indicated by the changes in surface condition of the pavement in the form of deterioration in the riding quality, which can be measured by simple methods; it is also possible to restore the surface to original condition of the pavement by providing a profile correction course and a resurfacing layer. Scope of transportation system has developed very largely. Ordinarily the term pavement only means the surface layer. But in the designing of the highways, it means the pavement total thickness including wearing course, base course and sub-base course. It is hard and tough crust constructed over the natural subgrade in order to provide stable and leveled or flat surface for vehicles. It is a structure consist from overlies layers of materials over the natural subgrade which its primary and major function is to transfer and distribute the vehicle axle loads to the subgrade. The structure of pavement should provide acceptable riding quality surface, sufficient skid resistance and minimum noise pollution. A highway pavement is a structure consisting of superimposed layers of processed materials above the natural soil sub-grade, whose primary function is to distribute the applied vehicle loads to the sub-grade. The pavement structure should be able to

provide a surface of acceptable riding quality, adequate skid resistance, favorable light reflecting characteristics, and low noise pollution. The ultimate aim is to ensure that the transmitted stresses due to wheel load are sufficiently reduced, so that they will not exceed bearing capacity of the sub-grade. Two types of pavements are generally recognized as serving this purpose, namely flexible pavements and rigid pavements. This chapter gives an overview of pavement types, layers, and their functions, and pavement failures. Improper design of pavements leads to early failure of pavements affecting the riding quality. Requirements of a pavement

An ideal pavement should meet the following requirements:

1. Sufficient thickness to distribute the wheel load stresses to a safe value on the sub-grade soil,
2. Structurally strong to withstand all types of stresses imposed upon it,
3. Adequate coefficient of friction to prevent skidding of vehicles,
4. Smooth surface to provide comfort to road users even at high speed,
5. Produce least noise from moving vehicles,
6. Dust proof surface so that traffic safety is not impaired by reducing visibility,
7. Impervious surface, so that sub-grade soil is well protected and
8. Long design life with low maintenance cost.

## II. LITERATURE REVIEW

1. **Feigham et al., (1986) [1]** researched the costs and service lives of these treatments in Indiana this information was deemed essential to allocate maintenance funds, identify the most cost effective procedures or materials affect longevity, enable planning for future maintenance requirements and many more.
2. **Lytton (1987) [2]** said that there are a number of variables that affects the deterioration of pavements. These major factors affecting pavement performance are considered in pavement design

procedures. For accurate prediction, the same factors should be considered in condition prediction models. These factors include treatment type, materials traffic loading, pavement structure, climates and pavement condition prior to the treatment.

3. **Sousa et al., (1991) [3]** in their research told that wheel tracking gradually grows under the influence of repeated loadings and typically depicted in the form of deformations along the wheel tracks, accompanied by small rearrangements at the ends. Two causes that contribute to wheel tracking is the compression and shear deformation. Its appearance may occur at various times during the life of a pavement.
4. **M.Wattan (1998) [4]** "Community participation in Rural transport infrastructure" which is a set of guidelines to help engage communities in the rehabilitation and maintenance of roads.
5. **S. Jain & P. Kumar (1998) [5]** analyzed that the cracking consists of visible discontinuities in surface and can be an indication of the pavement's structural condition and serious. The main problem with cracks is that they allow moisture into pavement, giving accelerated deterioration of pavement. Cracks can occur in a wide variety of patterns (see Plate 1). They may result from a large number of causes, but generally are the result of either ageing and embrittlement of surfacing, environmental conditions, structural or fatigue failure of the pavement, or any other causes.
6. **Sikdar et al., (1999) [6]** reported that if the potholes are numerous or frequent, it may indicate underlying problem such as inadequate pavement or aged surfacing requiring rehabilitation or replacement. Water entering pavement is often the cause, and could be caused by a cracked surface, high shoulders or pavement depressions ponds water on pavement, porous or open surface, or clogged side ditches.

### III. METHODOLOGY

The concept of evaluation of flexible pavement failures has become clear to some extent in the first chapter of this dissertation. The methodology used to reach the goals of this dissertation has been described in this chapter. The objective of this study is to establish guidelines describing systematic method for inspection and evaluation of pavement failures and to find out the possible causes of these failures. The proposed method has some basic steps as follows:

1. Inspection and Evaluation Plan
2. Pavement Condition Survey
3. Experimental work

4. Determine Probable causes of Failure
5. Select the best Maintenance Option
6. Report on Outcomes

### IV CONCLUSIONS

The main reason behind the road cracks and the deterioration of roads are as given below:

- Poor maintenance policy
- Poor drainage system
- Poor supervision
- Low construction quality

Pavement deterioration process starts very slowly so that it may not be noticeable, and over the time it accelerates at faster rates, there must be implementation of the proper maintenance and repair work in suitable time; which will maintain the pavement in a safe and acceptable operational condition and helps to save cost of maintenance. Road maintenance is one of the important components of the entire road system. Even if the roads are well designed and constructed, they may require maintenance. Repair and maintenance procedures cannot overcome bad design problems but can help prevent these problems resulting from degradation.

### V. FUTURE SCOPE

These types of researches should be carried out on other stretches of roads to evaluate their failures. There are certain aspects in this research which should be kept in mind before designing the life span of a flexible pavement.

### VI. REFERENCES

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