

A REVIEW PAPER ON EVALUATION OF FLEXIBLE PAVEMENT FAILURES

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Abstract This study is a survey to evaluate the flexible pavement conditions to determine and specify the types of the failures in the pavement for the selected highway. It is very significant to evaluate and identify the causes of the flexible pavement failures and select the proper and best treatment and maintenance. The study had two major and critical goals which covered by considering the following three tasks, the first was the visual evaluation and inspection of existing flexible pavement conditions including the failures, the second to determine and find out the actual causes of these failures in the pavement, and the third is to select the most and effective treatments and maintenance types. As a case study, of Ambala Cantt to Saha road was selected for evaluation and inspection purposes. The field evaluation works were achieved on the existing flexible pavement conditions of the selected rural highway. The results were most of the damages and failures in the pavement are serious and extreme surface deformation, cracks, disintegration, and surface defects. These damages and failures are caused by fatigue and other types of failures resulted from the movement of heavy vehicles and trucks, poor drainage design, unsuitable pavement layers thickness design, and improper pavement mix design and selected materials.

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. For designing purposes and depending on structural function and behavior, the road pavements types are generally divided or classified into two types:

- i. Flexible pavement
- ii. Rigid pavement

Other pavement types include semi rigid or composite pavement and interlock cement concrete blocks pavement. These pavement types are less familiar than flexible and rigid pavement. Flexible pavement design is the process and method of selecting the most effective and economical composition of flexible pavement courses or layers to fit the subgrade foundation. And cumulative traffic axle load to be carried and handled during the pavements' design life. Flexible pavement structure design is different from building design and the bridges because of the fact that the design of pavement until today is based on semi-empirical or empirical method and there is no rationalistic design method. Flexible pavement design consists mainly from two steps:

1- Material mix design to be used in each layer of the pavement

2- Design the structure of the pavement.

The main and major factors to be taken in consideration in the flexible pavement design are:

- 1- Traffic volume
- 2- Climate and weather conditions along the year
- 3- The road geometric design
- 4- Position
- 5- Soil or subgrade
- 6- Drainage

TYPES OF FAILURES OF FLEXIBLE PAVEMENT

Different types of failure encountered in flexible pavements are as follow:

1. Alligator cracking or Map cracking
2. Consolidation of pavement layers
3. Shear failure cracking
4. Longitudinal cracking
5. Frost heaving
6. Lack of binding to the lower course
7. Reflection cracking
7. Formation of waves and corrugation
8. Bleeding
9. Pumping

2 LITREATURE REVIEW

Hofstra and Klomp (1972) [1] found that the deformation in flexible pavements was greater in loading enforcement surface and gradually reduced depending on the depth. This is because the wheel tracking is a permanent deformation and thus increasing the depth increases the resistance and shear stresses are reduced. Asphalt with low shear strength, essential for resistance to repetitive loads of traffic, have intense display wheel tracking problem. The problem is more acute especially during the summer season, as high temperatures are observed on the roadway.

Sousa et al. (1991) [2] 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.

Sikdar et al (1999) [3] 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 ponding water on pavement, porous or open surface, or clogged side ditches.

Woods and Adcox (2004) [4] said pavement failure may be considered as structural, functional, or materials failure, or a combination of these factors. Structural failure is the loss of load carrying capability, where the pavement is no longer able to absorb and transmit the wheel loading through the structure of the road without causing further deterioration. Functional failure is a broader term, which may indicate the loss of any function of the pavement such as skid resistance, structural capacity, and serviceability or passenger comfort. Materials failure occurs due to the disintegration or loss of material characteristics of any of the component materials.

AAhmed (2008) [5] concluded the formation of cracks in the pavement surface causes numerous problems such as discomfort to the users, reduction of safety, etc. In addition to the above, intrusion of water causing reduction of the strength

in lower layers as well as lowering of bearing capacity of subgrade soil by pumping of soil particles through the cracks is also a major problem associated with the pavements.

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