

ANALYSIS OF FLEXIBLE PAVEMENT – ITS FAILURE AND MAINTAINANCE

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ABSTRACT : *A well-developed transportation infrastructure is essential for economic, industrial, social and cultural development of a country. Due to this need, human being has developed three modes of transport, i.e., by land, by water and by air. The road network has expanded from 4 lakh km in 1947 to 20 lakh km in 1993 and almost 55 lakh kms as on 31 March, 2015. India has less than 3.8 kms of road per 1000 people; including all its paved and unpaved roads. In terms of quality, all season, four or more lane highways; India has less than 0.07 kms of highway per 1000 people as of 2010. Inadequate maintenance of roads accounts to an act of disinvestment and sacrifice of past investment in roads. Roads have been receiving decreasing share of total Five-Year Plan expenditure (decreasing from 6.7% in first plan to 3% in second plan). The Vehicle Operating Cost increases at a rapid rate as the condition of existing pavements starts deteriorating. The loss due to bad conditions of the main road network would be around Rs.12000 crore per annum. Pavement structure can be destroyed in a single season due to water penetration. Defects in flexible pavements is a problem of multiple dimensions, phenomenal growth of vehicular traffic (in terms of no. of axle loading of commercial vehicles), the rapid expansion in the road network, non-availability of suitable technology, material, equipment, skilled labour and poor funds allocation have all added complexities to the problem flexible pavements. Maintenance of a road network involves a variety of operations, i.e., identification of deficiencies and planning, programming and scheduling for actual implementation in the field and monitoring. The essential objective should be to keep the road surface and appurtenances in good condition and to extend the life of the road assets to its design life. The purpose of the proposed study is to discuss the possible causes of pavement failures, and recommends better ways to minimize and hopefully eliminate the causes of failures in pavements.*

KEYWORDS: *Highway Failures, Maintenance and repairs*

INTRODUCTION

General:

From the beginning of history, human sensitivity has revealed an urge for mobility leading to a measure of Society's progress. The history of this mobility or transport is the history of civilization. For any country to develop with right momentum modern and efficient Transport as a basic infrastructure is a must. **Transport** (British English) or **transportation** (American English) is the movement of people and goods from one place to another. The term is derived from the Latin *trans* ("across") and *portare* ("to carry").

A road network system is perhaps one of the most important necessities for the economic development of any country, particularly developing countries. Many of developing countries,

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Published online on www.ijemt.com : June 6, 2022

therefore, invest huge amount on road construction, while many developing countries appreciate the necessity for huge investment in capital development of roads. Only a few gives due importance to the road maintenance. It is found more glamorous to embark on new construction than to maintain what is already in existence. But unfortunately, pavement structure can be destroyed in a single season due to water penetration. Maintenance activities may be required at intervals throughout the year, but their frequency varies with traffic, topography and climatic conditions, type of roads, grading and repairing pot

The Stages of Highway Development:

Although the names may vary by State, the five basic stages in the highway development process are: planning, project development (preliminary design), final design, right of way, and construction. After construction is completed, on-going operation and maintenance activities continue throughout the life of the facility.

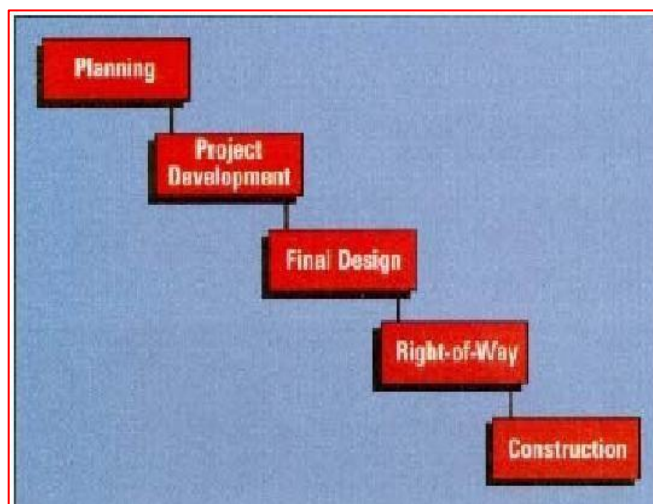


Figure: Process of Highway Planning

Geometric Design:

Geometric design for transportation facilities includes the design of geometric cross sections, horizontal alignment, vertical alignment, intersections, and various design details. These basic elements are common to all linear facilities, such as roadways, railways, and airport runways and taxiways. Although the details of design standards vary with the mode and the class of facility, most of the issues involved in geometric design are similar for all modes. In all cases, the goals of geometric design are to maximize the comfort, safety, and economy of facilities, while minimizing their environmental impacts. This chapter focuses on the fundamentals of geometric design, and presents standards and examples from different modes.

The geometric design of highways deals with the dimensions and layout of visible features of the highway. The features normally considered are the cross section elements, sight distance consideration, horizontal curvature, gradients, and intersection. The design of these features is to

a great extend influenced by driver behaviour and psychology, vehicle characteristics, traffic characteristics such as speed and volume. Proper geometric design will help in the reduction of accidents and their severity. Therefore, the objective of geometric design is to provide optimum efficiency in traffic operation and maximum safety at reasonable cost.

The planning cannot be done stage wise like that of a pavement, but has to be done well in advance. The main components that will be discussed are:

- Factors affecting the geometric design
- Highway alignment, road classification
- Pavement surface characteristics
- Cross-section elements including cross slope, various widths of roads and features in the road margins
- Sight distance elements including cross slope, various widths and features in the road margins
- Horizontal alignment which includes features like super elevation, transition curve, extra widening and set back distance
- Vertical alignment and its components like gradient, sight distance and design of length of curves
- Intersection features like layout, capacity etc.

Factors Affecting Geometric Design:

Design speed: Design speed is the single most important factor that affects the geometric design. It directly affects the sight distance, horizontal curve, and the length of vertical curves.

Edge Cracking: Crescent-shaped cracks or fairly continuous cracks that intersect the pavement edge and are located within 2 feet of the pavement edge, adjacent to the unpaved shoulder. Includes longitudinal cracks outside of the wheel path and within 2 feet of the pavement edge.





Figure: Edge Cracking

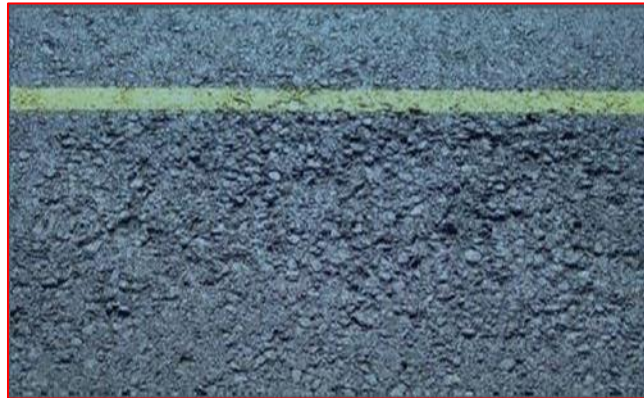


Figure: Segregation of Coarse Aggregate



Figure: Pumping

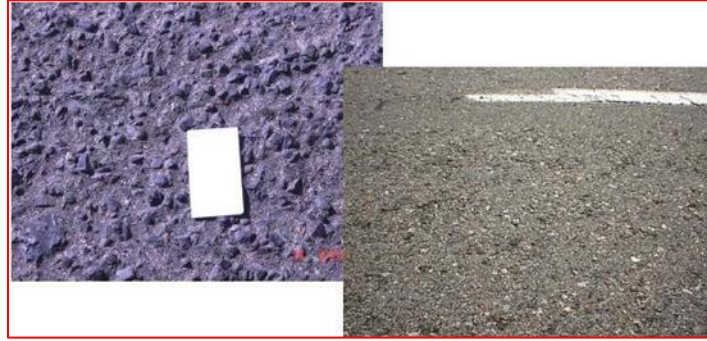


Figure: Reveling On Road

CONCLUSION

The case study was undertaken to investigate the road the failure on the particular stretch (Lucknow to sitapur) and purpose of this research is to analyze and evaluation of the pavement failure. Following conclusions have been drawn based on the present study:

- The technique is based on the past experience by keeping literature review in mind and selected the sample and best suitable method of analysis.
- Pavement condition index (PCI) was found out to know the condition of the pavement according to its distress sheet as per severity level from ASTM-D6433.
- From the method of pavement condition index, we got know the condition of the pavement which was coming out to be very poor in the range.
- The influencing parameters considered in this study are cracks and cracking pattern, roughness, pot holes and deflections. The above parameters have been classified according to their severity levels.
- Maintenance decision can be taken based on the criteria of reaching any one or all of the influencing parameters to their maximum acceptable limits.
- Since the maintenance option is required because the pavement is severe. So various kind of test were performed on the sample which was taken from the site and we found that the failure was coming by different reason.

References

- 1) Abd El Halim, A.O (1985) 'Influence of Relative Rigidity on the Problem on Reflection
- 2) Cracking' .TRR 1007, pp: 53-58 USA
- 3) Abdulkareem Y.A and K.A Adeoti (2004) 'Road Maintenance and National Development'.
National Engineering
- 4) Conference, Federal Polytechnic Offa, Kwara State Nigeria.