International Journal of Interdisciplinary Innovative Research &Development (IJIIRD)
ISSN: 2456-236X
Vol. 08 Special Issue 01 | 2023

A Study of Various Defects in Pavements

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ABSTRACT

As we all know Civil Engineering aspects have been changing day by day and it has been widely spreading in recent years. Development in India focuses majorly on road construction and infrastructure in the Civil engineering concept. This research is about the defects in flexible pavement and rigid pavement and the maintenance in flexible pavements and rigid pavement. In the past, lots of researchers have already studied the defects and problems of maintaining flexible pavements and rigid pavements all over the world. We are studying various defects on Chandrapur - Nagpur highway (NH-9) from Chandrapur to Bhadrawati, having 26 km length (19 km of flexible pavement road and 7 km is rigid pavement road.) Due to poor conditions of the road the majority of accidents, pollution and transportation time are increasing day by day to prevent this accident and pollution etc. We should maintain the road (repair) by this maintenance the accident and pollution of the environment will reduce and the transportation time will decrease and it will help the environment too.

Keyword : - Defects, flexible pavement, rigid pavements, maintenance.

1. INTRODUCTION

Pavement failure is characterized as a decline in use brought on by the formation of cracks and ruts. We need to look at the reasons why bituminous pavements fail before moving on to maintenance measures. Failures of bituminous pavement can be brought on by a number of different circumstances or a combination of factors. It has been noted that when performing maintenance operations, just 3 parameters the unevenness index, pavement cracking, and rutting are considered, leaving out additional distresses. Application of correction in the existing surface will increase the life of maintenance works as well as that of the strengthening layer. In addition to maintenance measures, other pavement preservation strategies can lengthen the lifespan of the pavement and prevent it from failing. This study's objectives were to assess potential causes of pavement distress and provide solutions to reduce pavement distress. The article outlines the first lesson discovered as a result of pavement issues and failures seen over the past several years on several projects in India. Several pavement preservation procedures and practices that will assist extend the useful life of the pavement is also presented based on prior experiences.

Both flexible and stiff hard-surfaced pavement types can be grouped. Flexible pavements are those which are surfaced with bituminous (or asphalt) materials These can be either in the form of pavement surface treatments (such as bituminous surface treatment (BST) often located on smaller highways) or HMA surface courses (generally used on higher volume roads such as the Interstate highway network). Because the entire pavement structure "bends" or "deflects" in response to traffic loads, these pavement varieties are referred to as "flexible." Several layers of materials that can allow this "flexing" often make up a flexible pavement construction. On the other hand, a PCC surface course makes up of stiff pavements. Due to the high elastic modulus of the PCC material, these pavements are much "stiffer" than flexible pavements. Moreover, these pavements may be reinforced with steel, which is typically employed to minimize or do away with joints.

The load is dispersed over the subgrade in a distinct way by each of these pavement types. Rigid pavement has a tendency to disperse the load across a relatively large region of the subgrade due to PCC's high elastic modulus (stiffness). The concrete slab itself supplies.

Much of the structural strength of a stiff pavement. Flexible pavement disperses loads over a smaller area and employs a more flexible surface. It depends on several layers to convey load to the subgrade. Ultimately, it could be unclear as to why one 1 pavement is utilized as opposed to another. State highway authorities often choose the pavement type based on economics, policy, or a combination of both. Every 10 to 15 years, flexible pavements often need some type of maintenance or restoration. Nonetheless, rigid pavements may frequently last 20 to 40 years with

little to no upkeep or repair. Rigid pavements are frequently employed in urban, high-traffic locations, thus this should not come as a surprise. Yet there are trade-offs, of course. When a flexible pavement, for instance, needs extensive restoration, the solutions are typically more affordable and easier to do than for rigid pavements. The basic traits and varieties of both flexible and stiff pavements will be covered in this section.

1.1 Aim

- To determine the flaws in the current pavement maintenance procedures.
- To recognize the many categories of typical flaws in flexible pavements.
- To identify the causes of these defects and suggest remedial measures.
- To fix the found flaws so that traffic flows more smoothly.

1.2 Objectives

- To limit the recoverable or elastic deformation of the pavement within the permissible limits so that the pavement can sustain a large number of repeated load applications without causing structural damage from the pavement layers' fatigue breakdown within the design life.
- To restrict the vertical strains on the subgrade and the other pavement layers within the desired limits so that the accumulated non-recoverable deformation in the form of rutting of if the pavement's design life, the pavement surface along the wheel routes is within allowable limits.

2. LITERATURE REVIEW

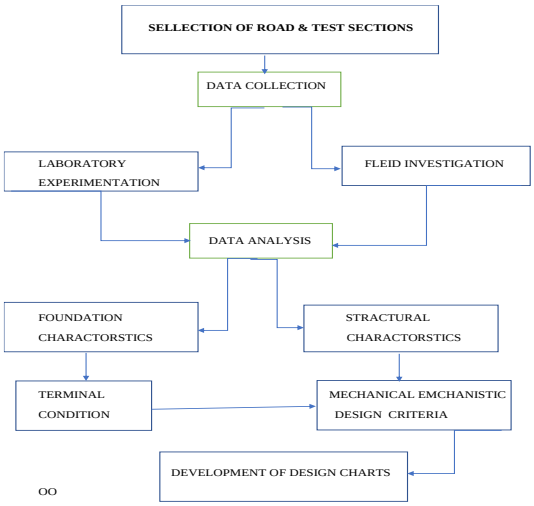
The causes of localized damage to flexible pavements and the different methods/materials used to repair them are covered in the literature review section.

P. Babashamsi, et.al (2016) In this study, the cost of building a road is broken down into design costs, material extraction costs, equipment costs, maintenance and rehabilitation plans, and operations costs over the course of the project's service life. The cost-efficiency of alternatives is assessed using the Life-Cycle Cost Analysis (LCCA) economic analysis method based on the Net Present Value (NPV) concept. To attain the lowest possible pavement life-cycle costs, it is critical to examine the aforementioned cost factors. Nonetheless, pavement managers sometimes struggle to take into account every vital component that would be necessary for carrying out upcoming maintenance work. Agencies and institutes have developed several methods for pavement life-cycle cost analysis during the past few decades (LCCA). [1]

Vinay Kumar V1 and Sireesh Saride (2016) in this paper reinforcement can be used effectively to improve the performance of the un surfaced rural pavements by reducing the rutting. The improvement in rutting resistance on unpaved roads is demonstrated by two performance variables, TBR and RDR. With an increase in settlement ratio and load repetitions, respectively, the TBR and RDR for the granular aggregate base exhibit a good improvement, with a TBR value of 1.87 at a settlement ratio of 15%. Using aggregate Rutting Behavior of Geocell Reinforced Base Layer over Weak Sand Subgrade, up to 22% RDR was attained.[2]

S.A. KristiawanEt.al 2013 in this Study authors try to explain many parameters affecting the magnitude of shrinkage stress. All of the factors involved in creating shrinkage stress should be included in any criterion used to determine the likelihood that the concrete overlay would break due to differential shrinkage. Assessment of shrinkage cracking behaviour of concrete overlay could be classified into qualitative and quantitative methods. [3]

3. METHODOLOGY



1. The first step would be to identify and select sites that have different types of pavements and defects. This would involve selecting a diverse range of locations with varying traffic loads, environmental conditions, and pavement structures. The sites would also be selected based on the type of pavement (flexible or rigid) and the type of defect (e.g., cracking. potholes, rutting, etc.).

Fig.1: Pathholes at Chandrapur Near Padoli Village

2. Once the sites have been selected, the next step is to collect pavement data and defects data. This would involve conducting surveys to gather information on the pavement structure, traffic load, environmental conditions, and any previous maintenance or repairs that have been carried out. The data would also be collected on the types and severity of the defects, including their size, location, and extent.

Fig. 2: Selected site for Maintenance work

3. The collected data would then be analyzed to identify patterns and trends in the defects across different pavement types and locations. Statistical analysis would be performed to determine the significance of the findings and to identify any correlations between the defects and the various factors that were collected during the site selection and data collection phases.[4]

4. Based on the analysis, the defects would be evaluated to determine their impact on pavement performance, safety, and service life. This would involve assessing the severity and extent of the defects and estimating their effects on the pavement's structural integrity. ride quality, and other performance parameters. The evaluation would also consider the type of pavement and the environmental and traffic conditions that the pavement is subjected to.[5]

Fig. 3: Shows Maintenance work By Paver Machine

5. Finally, based on the evaluation, recommendations would be made for maintenance and repair strategies to mitigate the impact of the defects and extend the service life of the pavement. The recommendations would take into account the type of pavement, the type and severity of the defects, and the site-specific conditions, as well as the available resources and budget constraints. The recommendations would also consider the proposed maintenance and repair strategies' long-term sustainability and environmental impacts.

Fig. 4 Levelling and Compaction of Road

4 CONCLUSION

After going through several Studies I conclude that pavement defects are a problem for a long time and there is a need to the identification of problems and rectify them.

One of the most important prerequisites for a country's economic development, particularly in emerging nations, maybe its road network infrastructure. several developing countries, therefore, invest huge quantities in construction, whereas several developing countries appreciate the requirement for huge investment in capital development of roads, just some provide due importance In terms of road maintenance, it's more thrilling to remove new construction than to keep what is already standing, but unhappily, pavement structure is also damaged in a single season. because of water penetration. Moreover, maintenance tasks are required periodically throughout the year; however, their frequency varies depending on factors such as traffic, topography, climate, the kind of roads, and the requirement for grading and fixing potholes and ruts on sealed roads. They embrace repairing potholes, surface fixtures, waterproofing cracks and level marking. The growth of the nation's economy, industry, society, and culture is aided by transportation.

Proper design, regular inspection and maintenance of drainage systems are of utmost importance in preserving the investment made in highway systems and in providing comfort and safety to the road user.

The classifications of all types of distress have been identified. The cause and treatment are different for different severity levels of each distress.

It's crucial to recognize and fix the flaws in the current highway maintenance procedures and systems. The influencing parameters considered in this study are cracks and cracking patterns, roughness, rut depth, potholes and deflections. The severity levels of the aforementioned factors have been categorized. Maintenance decisions can be taken based on the criteria of reaching any one or all of the influencing parameters to their maximum acceptable limits.

Before doing any substantial maintenance (overlay, renewal coat), the minor distress (cracking, potholes, pushing, rutting, etc.) must be fixed. If small flaws are fixed before overlaying, even a thinner overlay will produce superior results.

5 REFERENCES

[1] P. Babashamsi, N.I. MdYusoff, H. Ceylan, N.G. MdNor, H. SalarzadehJenatabadi(2016)" Evaluation of pavement life cycle cost analysis: Review and analysis".

[2] Z. Rashid, R. Gupta, "Study of Defects in Flexible Pavement and Its Maintenance," International Journal of Recent, Engineering, Research and Development, vol. 2, no. 6, pp. 30-37, 2017.

[3] SA Kristiawan (2013) ‘’Performance Criteria to Assess Shrinkage Cracking Tendency in Concrete Overlay”
[4] Vinay Kumar V1 and SireeshSaride(2016) “Rutting Behavior of Geocell Reinforced Base Layer Overlying Weak Sand Subgrades”.
[5] S.A. Wada, “Bituminous Pavement Failures,” International Journal of Engineering, Research hand Applications, vol. 6, no. 2, pp. 94–100, 2016.

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