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Literature Review on Flexible Pavement Rehabilitation SH177 (CH: 0.00 To CH: 9.00) Vyara Junction To Anumala Junction : Parul University, Vadodara

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ABSTRACT

The evaluation of a functional behavior or performance analysis, information is needed on the history of riding quality of the pavement stretch. In condition survey, pavement surface condition is measured and which types of the distress is observed. For the subgrade evaluation soil sample is taken at required locations on road stretch. In the structural evaluation of flexible pavement the pavement deflection is measured by the Benkelman Beam. It is possible to measure the rebound and residual deflections of the pavement structure. While the rebound deflection is one related to pavement performance, the residual deflection may be due to non-recoverable deflection of the pavement or because of the influence of the deflection bowl on the front legs of the beam. Rebound deflection is used for overlay design. A detailed pavement condition survey is done on State Highway 177 (Vyara Junction to Anumala Junction) and the road condition is evaluated structurally. The present study is evaluates the overlay thickness for State Highway 177 Vyara Junction to Anumala Junction.

Keywords : Pavement, Subgrade.

I. INTRODUCTION

All civil infrastructures have a definite life span. In other words, all structures are designed to fail at some point but the life of structure is extending by the maintenance and rehabilitation activities. The maintenance and rehabilitation activities of pavement structures become increasingly important as pavements deteriorate with time and traffic. The combined effects of traffic loading and the environment will cause every pavement, no matter how well-designed/constructed to deteriorate over time. Maintenance and Rehabilitation activities range from correcting surface defects for\ improving ride quality to increasing structural capacity of the pavement structure.

“Rehabilitation is the act of repairing portions of an existing pavement to reset the deterioration process. “The combined effects of traffic loading and the environment will cause pavements to deteriorate over time. Although maintenance can slow the rate of deterioration, it cannot stop it. Therefore eventually the effects of deterioration need to be reversed by adding or replacing material in the existing pavement structure. This is called rehabilitation. Rehabilitation can be also defined as a structural or functional enhancement of a pavement which produces a substantial extension in service life, by substantially improving pavement structurally and functionally regarding the difference between maintenance and rehabilitation, there is mix concept of maintenance and rehabilitation. [1]

The pavement maintenance aim to preserve pavement condition, safety and ride quality and therefore aid a pavement in archiving it is a design life, but rehabilitation is the redressing of significant problems that are already part of the pavement. India has the second largest road network of roads, next to USA. By spatial distribution, the density of road is better than USA. The road network has expanded from 0.4 million km in 1947 to 4.24 million km in 2012.

Objectives

- To evaluate the existing condition of the road.
- To find out type of pavement deterioration.
- To established the causes of pavement deterioration.
- To suggest remedial measures.

II. METHODS AND MATERIAL

Literature Search

Elena Romeoa,*, Antonio Montepara(2012) The primary benefit of the reinforcement is to significantly reduce tensile stresses in the surface layer shifting the maximum tensile and shear stress from the bottom of the surface layer to the bottom of the interlayer itself, thus reducing the fracture potential in the surface. Fiberglass C and steel reinforcements perform best due to the high bond strength developing between the grids and the surrounding asphalt mixture. It was observed that specimen geometry influences only the cracking behavior of steel-reinforced system. Steel net consists in a double-twist 80x100 mm hexagonal mesh, transversally reinforced with steel wires at regular intervals of 160 mm, thus a 100 mm width specimen results not adequate for investigating the bidirectional contribution of the interlayer. Conversely, a 500x500 mm specimen allows the reinforcement to act in both x and y directions optimizing load transfer and shear resistance and providing better aggregate interlocking.

P. Babashamsi, N.I. MdYusoff, H. Ceylan, N.G. Md Nor, H. SalarzadehJenatabadi(2016) in this paper cost of road construction consists of design expenses, material extraction, construction equipment, maintenance and rehabilitation strategies, and operations over the entire service life. An economic analysis process known as Life-Cycle Cost Analysis (LCCA) is used to evaluate the cost-efficiency of alternatives based on the Net Present Value (NPV) concept. It is essential to evaluate the above-mentioned cost aspects in order to obtain optimum pavement life-cycle costs. However, pavement managers are often unable to consider each important element that may be required for performing future maintenance tasks. Over the last few decades, several approaches have been developed by agencies and institutions for pavement life-cycle cost analysis (LCCA).

Vinay Kumar V1 and SireeshSaride(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 against rutting in unpaved roads is shown in terms of performance factors namely TBR and RDR. The TBR and RDR for the granular aggregate base shows a good improvement with the increase in settlement ratio and number of load repetitions respectively with a TBR value of 1.87 at a settlement ratio of 15%. As high as 22% RDR was achieved with aggregate Rutting Behavior of Geo cell Reinforced Base Layer over Weak Sand Subgrade.

PriyankaSarker, ErolTutumluer , and Scott Lackey(2016) in this paper the ease in use and simplicity, such an empirical approach is outdated and lacking in many aspects to characterize recycled and/or nontraditional construction materials nowadays more commonly used in pavements. As far as the rehabilitation of low volume roads is concerned, the lack of testing for evaluating the structural condition of existing, in-service pavements often results in uneconomical and unreliable practices. This paper presents a mechanistic-empirical approach for overlay thickness designs of low volume pavements through a combination of non destructive deflection testing and re-established pavement damage models.

SA Kristiawan(2013) in this paper there are many parameters affecting the magnitude of shrinkage stress. Any criteria used to assess cracking tendency of concrete overlay caused by differential shrinkage should take into account all of the parameters involved in building up shrinkage stress. Assessment of shrinkage cracking behaviour of concrete overlay could be classified into qualitative and quantitative method.

Dr.H.C.Mehndiratta, Dr.Praveen Kumar &M.SateeshKumar(2013)in this paper Empirical approach is acceptable only if crack initiation is considered and not where crack propagation is considered. Especially in the design of overlays over existing cracked pavements, fracture mechanics principles may be used to take into account the detrimental effects of stress concentration around the crack.

Shivangi Gupta &A.Veeraragavan(2009) in this paper

present work is to study the benefit of SBS (Styrene Butadiene Styrene) polymer modified bituminous mixes on fatigue performance. The physical and mechanical properties of polymer modified and conventional binder mixes are evaluated. Mixes are compacted using both Marshall and Superpave Gyratory Compactor (SGC) and a comparison between the two is established in terms of the resilient modulus and fatigue life. Repeated load indirect tensile test equipment is used to evaluate the life to crack initiation and resilient modulus of the bituminous mixes. Retained Marshall stability and indirect tensile strength ratio tests were conducted. The improvement in fatigue life of polymer-modified mixes over the conventional mixes is reported. The research paper also describes the application of LEFM (linear elastic fracture mechanics) to characterize crack propagation using Indirect Tensile Fatigue Test (ITFT).

N. H. Jalkotr & A. S. Khaire, Superintending Engineer(2008) in this paper he has done the box return at Parga on Bridge on S.H. 62 across Bhima River in Pune District failure of the weir due to the flooding and by the use of the box return rehabilitation lifted by hydraulic jack treatment arrangement is done and also show how this rehabilitation is use in cost benefit.

Prithvi Singh Kandhal*, V. K. Sinha & A. Veeraragavan (2008) in this there is a proliferation of bituminous paving mixes in India. MORTH Specifications broadly provides 4 mixes for base courses, 6 mixes for binder courses and 4 mixes for wearing courses. Further two grading, each of BM, DBM, SDBC and BC are specified in the MORTH specifications. Too many options for a specific bituminous course have created confusion in mix selection and are mainly responsible to a considerable extent for the poor performance of flexible pavements in India. A case has been made out on technical grounds to have only 5 dense graded mixes of different nominal maximum aggregate size (NMAS) in the specifications, as is the case in most developed countries of the world.

B.N. SINHA (2007) has applied different methods of slope stability analysis of earth embankment have been discussed. The mathematical equations and the methodology for calculating the factor of safety of earth slope of any specified(chosen) slip circle by various methods has been given. By repeating the process for different slip circles, the minimum factor of safety can be calculated and critical slip circle obtained. For the purpose of direct comparison and easy explanation the critical circles were first established by the computer software by various methods of analysis and to illustrate the method only these circles were analyzed through independent mathematical equations and computations using Microsoft Excel program for the iterating process. It could be seen that without the use of computer for the analysis, particularly the iterating process, it would have been very cumbersome and time consuming to do the same by manual calculations. But it is possible to do complete analysis by Excel as explained in this paper. Graphical method can be used for marking the circle and various slices as is the normal practice for slope stability analysis. Graphical method of analysis can be used to draw force polygon to obtain various forces and computing factor of safety, but this paper has dealt with mathematical equations only for the analysis part. Since the main emphasis is on explaining and demonstrating the various methods, set of minimum forces.

III. CONCLUSION

1. The visual observation for Cracks ,Potholes, Raveling, Stripping can explain weak sports of pavements.
2. The Benkelman beam study was conducted on all the selected sections of SH: 188 from Sarsa to Vasad Junction of the road and structural inadequacy were found in all the sections.
3. There is a need to go for measures such as an overlay on all the sections of SH: 177 from Vyara To Anumala Junction. The overlay thicknesses in terms of Bituminous Macadam were found for all the stretches, it ranges from 110mm to 210mm.
4. The visual observation and Benkelman beam deflection correlates each other.

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