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A Review Paper on Evaluation of Rigid Pavement Failures

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Abstract: ***Now a day most of the pavements are constructed with rigid pavements (PCC) because of its good results. In this study work shows the main failures who shows over the study area and some options to solve the problems. This topic is very wide, here only some failures were examine in this evaluation study. Rigid pavement constitutes are economically as well as easily available at maximum places. At special conditions like very high temperature or very low temperature the rigid pavement are more suitable then the flexible pavements. Evaluation makes pavement better maintenance, durability etc.***

I. INTRODUCTION

Rigid pavements are those structures which are composed of PCC (Plain Cement Concrete) built on the top of sub grade and base course. The pavement structure distributes the loads over a wide area with one or two structural layers due to relative rigidity Surface course is the top layer which consist of PCC slab and base course is the layer laid below the PCC slab consist of crushed aggregates and well compacted soil. Generally it is observed that after the opening of newly constructed road or well maintained or newly widened road which is very good in the terms level of service, but it is after some time with the use of traffic volume and constantly changing weather, especially after monsoon or in monsoon the road quality is decorate at every use of traffic and after some time it gets completely decorated with uneven crack, pot holes, ruts, crack etc. This problem is very much common in every road. Hence the quality and level of service is dropped down drastically as the road user increase but maintenance is overlooked. Pavements fail prematurely because of many factors. There are four primary reasons pavements fail prematurely, like failure in design, failure in construction, failure in materials, failures in maintenance. Here for case study I will pick the rigid pavement for evaluation of failures, and its remedies. If the pavement remain failure one and doesn't maintained as per need than VOC (vehicle operation cost), travel time, traffic congestion, traffic volume, traffic density and lots of precious man hours / time is wasted. So the pavement should be well maintained and good for smooth riding to road user which overcomes the VOC, traffic congestion, traffic volume, traffic density and precious man hours.



Fig 1.1 Shrinkage Cracks

The pavement failures like cracking, pot holes raveling, depressions, rutting, upheavals, and shrinkage cracks are showing on rigid pavement. Rural Roads play an important role in the development of the country, as major part of the Indian population stays in rural areas. The construction of cement concrete rural roads has gained momentum due to the central government sponsored program called Pradhan Mantry Gram Sadak Yojana (PMGSY). Pavement condition consists of four main components; riding comfort, load carrying capacity, safety and aesthetics. Pavement condition data are collected to assist in making decision on highway maintenance, rehabilitation and reconstruction. For successful maintenance of the rigid pavement, it is essential to know the present condition of the pavement to withstand the designed traffic under prevailing climate and environmental conditions. When pavements are subjected to increased magnitude of wheel loads the pavement deterioration starts earlier than the anticipated design life. The PSI (Present Serviceability Index) models and PCI (Pavement Condition Index) help to analyze the present condition and to provide a proper maintenance to the pavements to increase the service life. The first portland cement concrete street built in Bellefontainea, United State of America in 1893.

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II. LITERATURE REVIEW

Many previous studies that were similar are studied for better understanding and further progress to the study of rigid pavement evaluation. In this study different publications which are similar to this study are discuss below:-

David L. Allen (1999) stated that the primary objective of this study was to analyze the concrete pavements are under nonlinear temperature distribution and vehicle wheel loading. The jointed concrete pavement system consists of concrete slabs with transverse and longitudinal joints, dowel bars (across transverse joints), tie bars (across longitudinal joints), subbase and subgrade soil.

David Jhones (2005) summarize the investigations undertaken by the University of California Pavement Research center between 1998 and 2005 to assess Caltrans strategies for the construction of rigid pavements, specifically jointed plain concrete pavement. The overall objectives of the study are reviewed and the studies undertaken to meet these objectives, namely desktop studies and laboratory and full-scale experiment are discussed. The reports and recommendations from each study are listed, as well as some details on how the recommendations have been implemented.

M. Ayres, M. Dater (2011) reports that the primary focus of this research was to determine the effects of design and construction features, such as overlay thickness and mix type, presence of milling, and type of restoration, on pavement response and performance to establish their importance in the prediction of future performances of rehabilitated pavements. Long-Term Pavement Performance program SPS5 and SPS6 (Specific Pavement Study) experiments provided information obtain a better under construction features on pavement response and performance of rehabilitated flexible and rigid pavements. The analyses results obtained in this study helped determine the causes of distress and helped formulate models for predicting performance of rehabilitated pavements.

Kshitija N. Kadam (2016) the ultimate aim of study is to ensure that the transmitted stresses due to wheel load and temperature variation must be sufficiently reduced, so that they will not exceed the bearing capacity of the sub-grade. Computation of stresses in concrete pavement under complex loading condition involving application of wheel loads when the slabs are curled due to temperature variation and moisture gradient in slab is of prime importance. These stresses observed in rigid pavement must be critically assessed as they have significant effect on various design parameters.

Sheryl Francis (2016) suggested that recent findings on potential of waste aggregate in concrete pavements. Waste aggregates namely RCA (Recycled concrete aggregate), RAP (Recycled Asphalt Pavement) and WFS (Waste Foundry Sand) were considered in the review study. There are considerable laboratory findings for use of waste aggregate in concrete pavements. However, there is limited information available on field studies in Indian scenario. From the studies conducted in United States and Europe, it is clear that RCA and RAP do perform when used as aggregate in concrete pavements. There is no specific information available on field performance of WFS in cement concrete, but laboratory studies show that WFS can be partially replaced for fine aggregate in cement concrete pavement.

III. OBJECTIVES

The main objectives of this study are given below:

A. To evaluate different types of defects e.g. scaling of cement concrete, shrinkage cracks, joint spalling, warping cracks, pumping.
B. To evaluate causes of defects affecting failures.

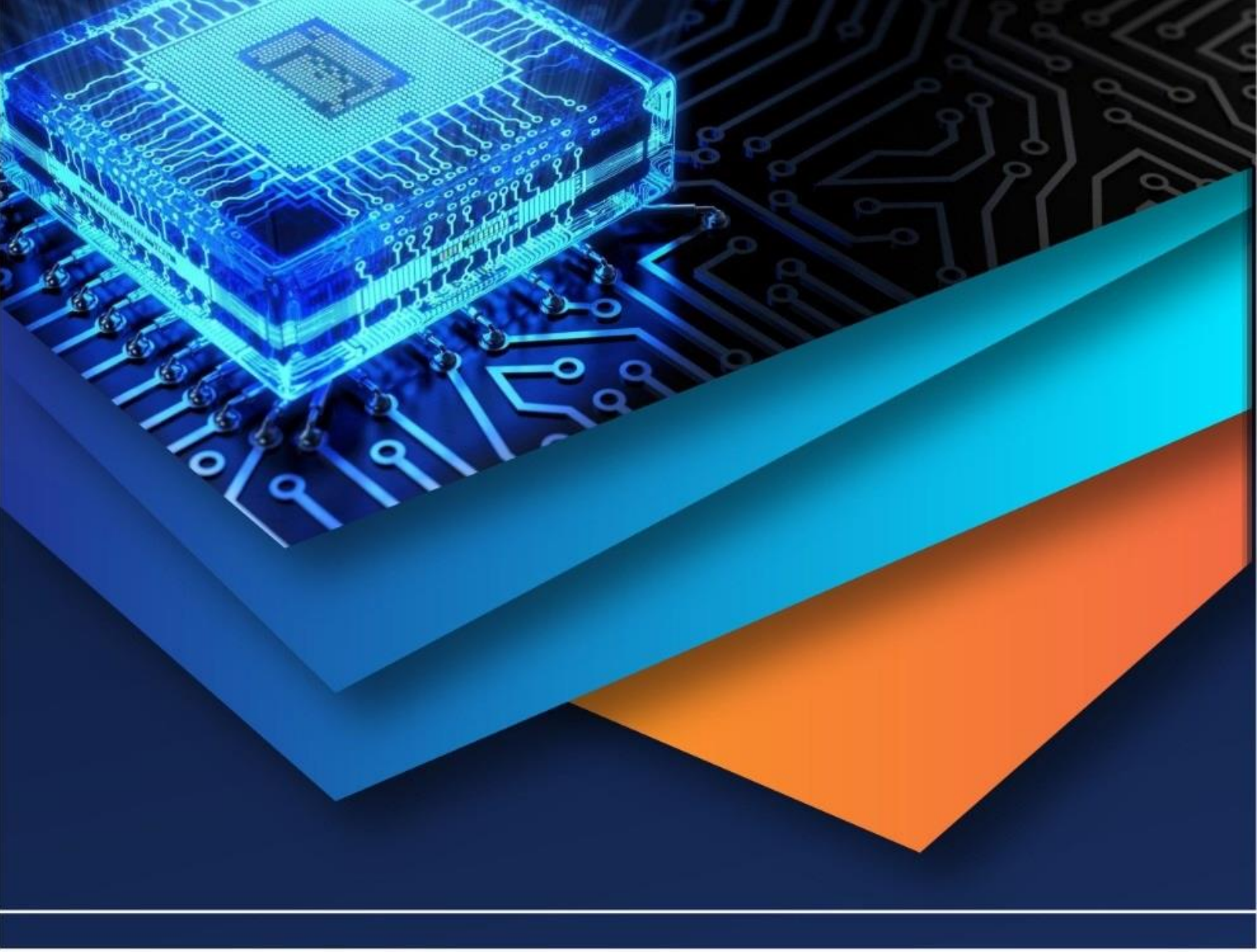
IV. FUTURE SCOPE

Further evaluation study can be carried out regarding failures in adding to the types of failures dealt in this study.

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