DISTRESSES ANALYSIS OF FLEXIBLE PAVEMENT ROADS BY PAVEMENT CONDITION RATING METHOD :- A COMPARATIVE STUDY

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Abstract- After excessive needs for pavement maintenance, rehabilitation and the limitation of available fund it is require to do pavement distress analysis and pavement condition rating for flexible roads. Distress analysis and pavement condition rating is use for maintenance budget. It is commonly found that rate of wearing and tearing of flexible roads changes from good condition to sever condition within a decade of time. The study is carried out 25 (2 lanes) roads from the different location of Dhule and Malegaon cities. The lanes are surveyed to find out different distresses conditions based on Indian Road Congress (IRC) and WSDOT Guidelines. The importance of this study is also that, it will helpful to the agencies for use of most suitable method of PCI calculation. To compare both the methods the similarity study and correlation analysis is carried out. The study identified nine type of distresses from which best maintenance rehabilitation strategies are proposed. This study gives solution for urgent repairing and maintenance of damaged roads.

Keywords: - Distress analysis, Physical survey, Pavement condition index, Correlation analysis

1. INTRODUCTION

India is said to be the fastest developing countries today. Although India is doing exceptionally well in industrialization there are still certain areas where the country is lagging behind. India's road network is gigantic. But one of the striking underlying facts is the condition of the roads. India is home to several bad roads be it the metropolitans, the cities or the villages. The other problems faced by the Indian roads are; bad riding quality, poor geometrics, and insufficient pavement thickness. Pavement management indicate vast areas of highway engineering, but the central issue in this particular topic is Pavement condition Index (PCI) that rate the performance of the pavement based on a scientific and systematic analysis of the pavement distresses.

The concept of pavement distress analysis and pavement condition rating for flexible pavements came into practice in the last decade due to an excessive needs for pavement maintenance and rehabilitation. To examine pavement condition rating and distress analysis for evaluation and measure of road surface condition and to detect distresses, severity and extent. For the calculation of pavement condition indices distress analysis is carried out.

The distresses are measure on flexible roads by physical examination. By using the IRC and WSDOT manuals the values of pavement conditions indices are found out and relation between these two methods is tabulated and suggests the most suitable method.

2. RESEARCH OBJECTIVES

Following are the main objectives of this study:

1. To identify the distresses from 25 (2 lanes) road in the Dhule and Malegaon cities.
2. To calculate PCI values lane by lane with IRC and HPS method
3. To compare these two methods using correlation analysis.
4. To find relationship between the IRC method and HPS using the distress wise analysis.
5. To determine the similarities between the distress identification manuals

3. METHODOLOGY

Research methodology is divided in three phases.

A. Phase 1
B. Phase 2
C. Phase 3

- Phase 1:
  This phase includes Literature review, objectives and problem statement which are based on research area that have been selected as case study of Urban.

- Phase 2:
  The site visits were conducted frequently to identify the types of distresses, and actual measurements of the distress are taken. To identify severity and extent distresses.

- Phase 3:
  On the basis of actual data collected from 50 lanes of Dhule and Malegaon cities. The PCI values are determined also Severity is calculated based on IRC and HPS manuals of distresses analysis. And then the correlation analysis is carried out to comparison between the two methods. The research methodology is given in below table.
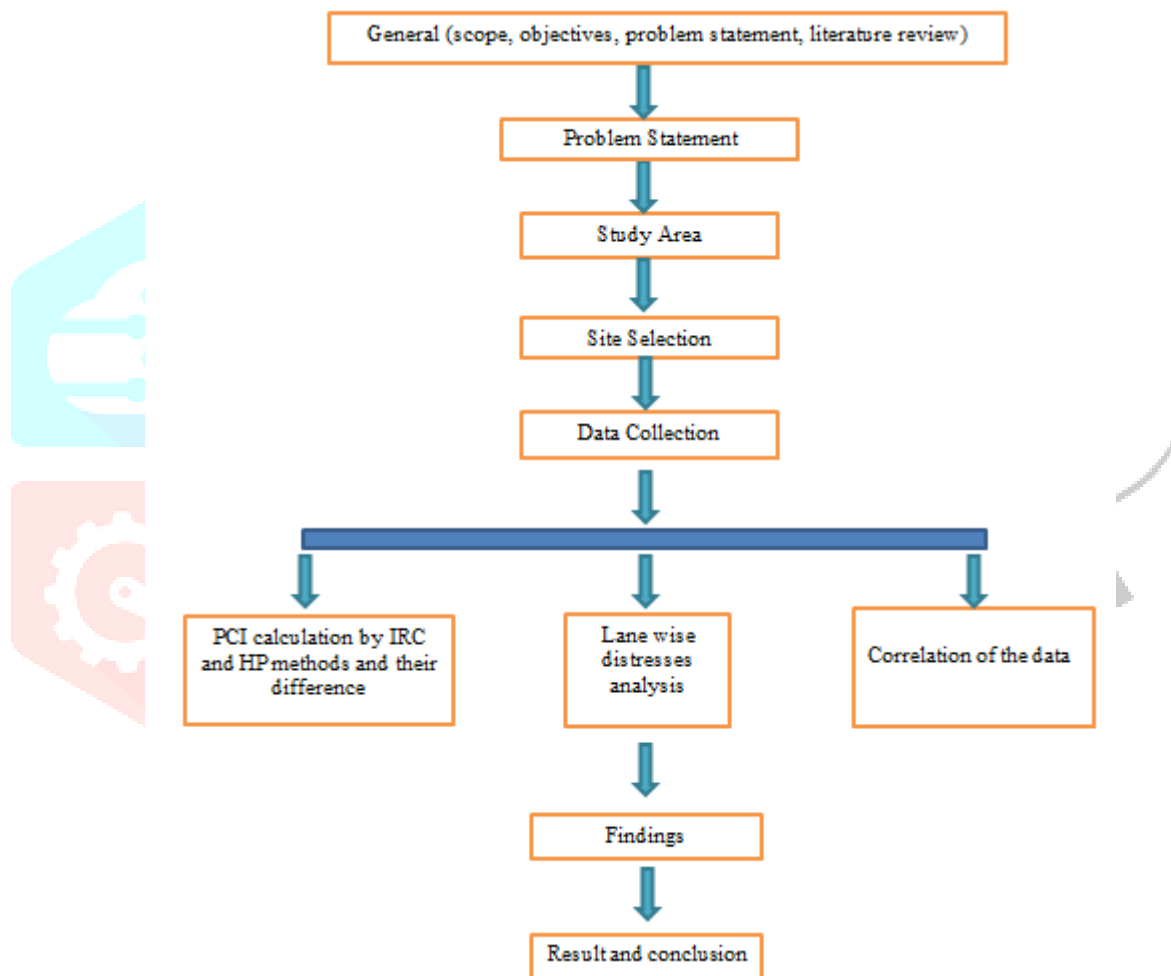

Figure (1) Research Methodology

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4. DATA COLLECTION AND ANALYSIS

The data is collected within the 50 lanes urban and MDR roads of Dhule and Malegaon cities by visiting the roads by physical inspection for the surface distress. Each lane is individually surveyed for 100m length and an average width of 3.5m. Using IRC the distress are measured and recorded in standard format. Data and Pictures are recorded are tabulated in the Microsoft excel and complete data is created for the 50 lanes.

A Distress analysis:

To find out further facts about this deviation the distress wise analysis is to be carried out. To carry out the distresses analysis the IRC and WSDOT distresses identification manuals are used. The detailed distress wise analysis is shown in appendix 3.

The matching and mismatching criteria of distresses between both the manuals have been determined. The matching and mismatching criteria for the distresses identification for the severity and extent based on IRC and WSDOT shows in below table.

Table 1 Matching and Mismatching Criteria by Percentage

S.N.	Distress Type	Severity	
		Matching %	Mismatching%
1	Patching	51.35	48.65
2	Raveling	40.91	59.09
3	Pothole	78.57	21.43
4	Alligator –Cr	100.00	0.00
5	Bleeding	28.00	72.00
6	Longitudinal –Cr	100.00	0.00
8	Edge breakage	71.43	28.57
8	Shoving	33.33	66.67
9	Settlement	100.00	0.00

The table 1 shows nine type distresses found in all 50 lanes .The percentage wise matching and mismatching criteria between both the methods. It is to be found out that in to what extent the severity and extent analysis matches and both methods give the same result and wise verse.

Distress wise matching and mismatching criteria of IRC and WSDOT distresses

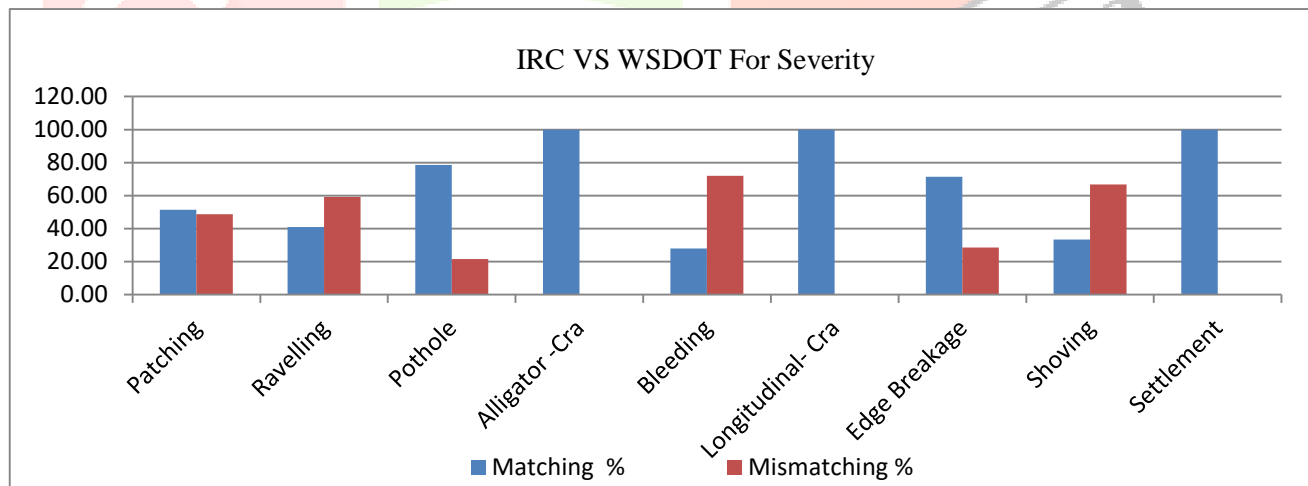The graphical representation of table 1 is under.

Figure 2: severity

Inference from figure 2 of severity is:

a) Raveling, Alligator cracking, longitudinal cracking, Settlement, Shoving are the forms of distress that both the manuals give the same result for severity analysis.

b) Patching, Bleeding, are the forms of distress that both the manuals in general give 50% (more or less) matching and 50% (more or less) mismatching result for severity analysis.

c) Edge breakage, Pothole is the form of distress that both IRC and WSDOT give the opposite result for severity analysis.

5. RESULT

Percentage wise categorization of similarities between IRC and WSDOT for severity and extent
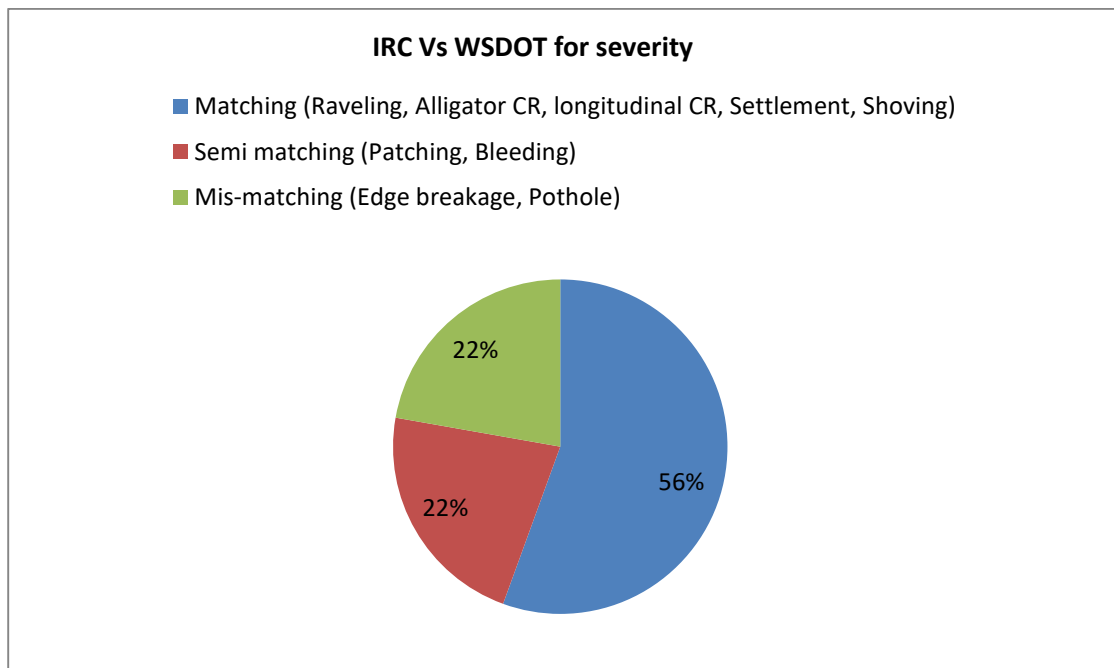

Figure 4 Severity

Figure 4 Indicates (in case of severity):

a) Out of the observed common types distresses for 56% of the distresses IRC and WDOT gives the highly similar result.

b) Out of common types of distresses for 22% of the distresses IRC and WDOT gives the less similar result.

c) Out of the observed common types of distresses for 22% of the distresses IRC and WDOT give the opposite result.

6. CONCLUSION

   To summarize, it is important to state that 50 lanes of flexible roads from Dhule and Malegon cities are investigated and the distresses are recorded. Based on this actual data, the Indian based method of PCI calculation and a European based HPS for PCI calculation have been compared. Lane- wise PCI values are calculated.

a) The PCI values are calculated for 50 lanes urban flexible roads based on 1-3 points rating scale by IRC method and based on 0-100 points rating scale by HPS.

b) Correlation analysis has been carried out and it results on a very weak correlation coefficient between IRC method and HPS is (0.1722)

c) Based on the analysis the similarities between IRC and WDOT are investigated for severity . It is resulted that in case of severity for 56% out of 100% IRC and WDOT give the highest similar result. And at the rate of 22% out of 100% they give the medium similar result. However for 22% they mismatch.

7. REFERENCES

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