

A Comparison Study on Distress Analysis by IRC & WDOT Methods for Flexible Roads

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ABSTRACT: In developing country like India there is a huge need for maintenance and rehabilitation of pavements. Under this particular topic the pavement condition rating is a controversial issue. Because different methods give different result on pavement condition index. Since many comparative studies have been carried out on PCR, and this study is a step further on the same problem to carry out a comparison study on pavement distress analysis for flexible roads. Based on the previews study a comparative study on PCR for flexible roads, the data that is gathered for 50 lanes of urban roads (flexible pavements) is further analysed distress wise to differentiate between Indian Road Congress (IRC) manuals of distress evaluation and European based (Washington Department of Transportation) guidelines for distress evaluation.

KEYWORDS: Maintenance and rehabilitation, Pavement Condition rating, pavement distress analysis, Flexible roads, differentiate, manuals.

I. INTRODUCTION

Most of the developing countries such as India and Afghanistan, between 1960 and 1980s have lost their valuable infrastructure worth millions and billions of dollars with regard to their road deterioration [8]. Large and enormous road networks, that are constructed at heavy expenses are not getting maintained and rehabilitate properly and they are prone to heavy and deadly traffic abuse. In current situation the cost of maintenance and restoration for that is three to four times greater than that of payment would have been for timely maintenance. Because the M&R is one of the most important matter in pavement management, for that reason the basics for M&R is pavement condition rating and pavement distresses analysis. This study is conducted in continues to the previews study on comparison of IRC and HP methods of PCI calculation for 50 lanes urban roads, Pune city. Since in the previous study, the methods for PCR give quite different result, on that basis distress wise analysis to differentiate between both IRC and HP distress evaluation manuals is to be studied in details.

II. RELATED WORK

Prior to this, a comparative study on PCI calculation based on IRC method and highway preservation (Canadian based) method had been carried out. The aforementioned study presents the distress analysis of 50 lane urban roads from Pune city. The lane wise PCI values are calculated based on the method of IRC and HP. Both the methods are compared and the methods give different result, also the correlation coefficient between both the method results on 0.274, which shows a very weak correlation. There is a huge need for a complementary study on the same topic and the present study will contribute to this topic in to some extent.

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III. METHODOLOGY

Research methodology is based on three stages:

- A. Pre data collection
- B. Data collection
- C. Post data collection

A. *Pre data collection:*

This stage consists of literature review, setting of objectives and problem statement and based on that selection of research area has been done. For the research purpose, urban flexible roads have been selected as a case study.

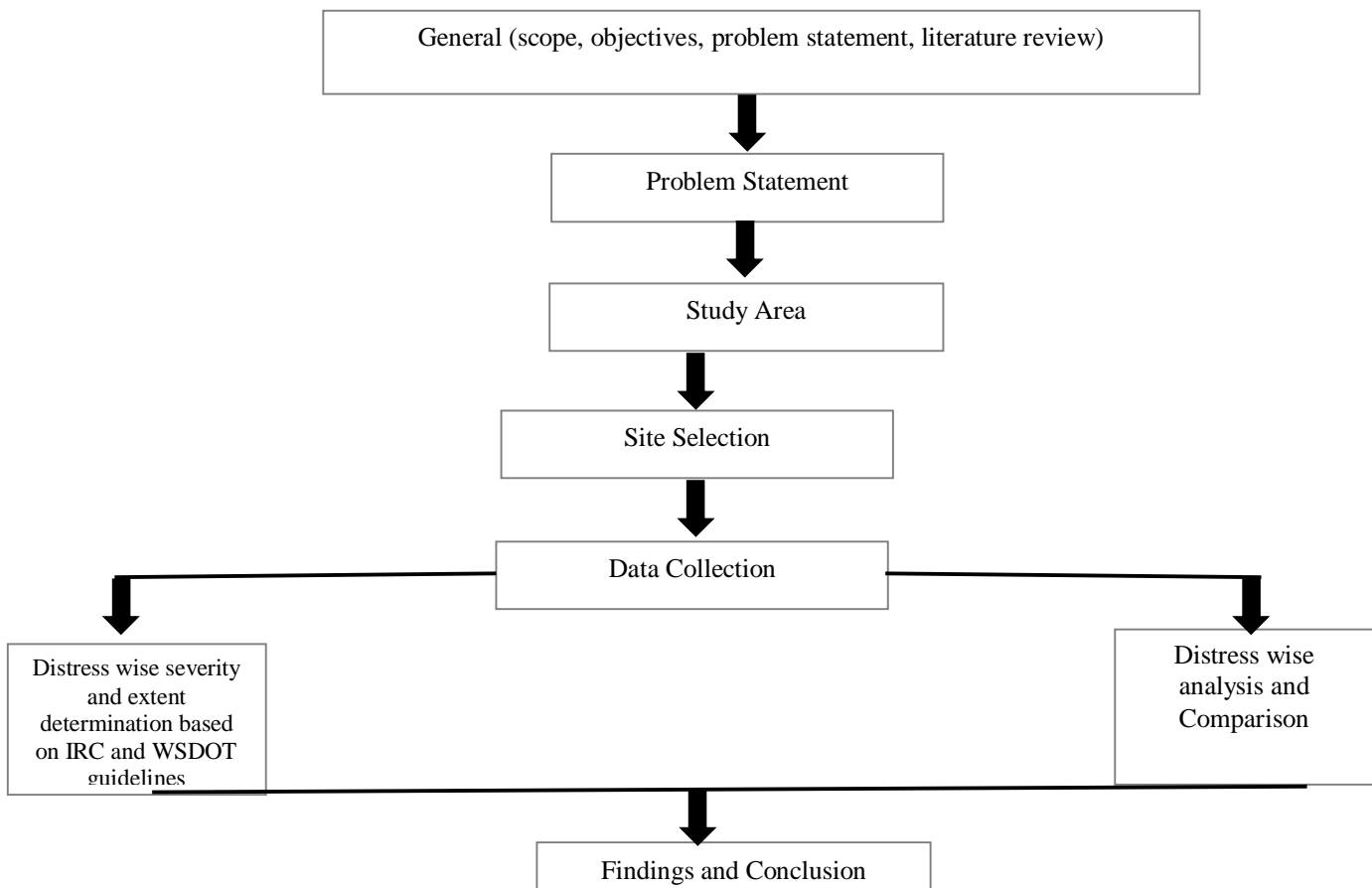
B. *Data collection:*

Frequent site visits were carried out to identify the types of distresses, actual measurement of the distresses had been taken place. Severity and extent of the distresses have been identified.

C. *Post Data Collection*

Based on the actual data collected from the 50 lanes of UFR Pune, severity and extent is determined based on IRC and WSDOT guidelines (distresses identification manuals). And thereafter the lane wise distresses analysis have been carried out to differentiate between both the manuals. The research methodology is further elaborated in figure (1)

Figure (1) Research Methodology



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IV. DATA COLLECTION AND ANALYSIS

The data for this particular study is collected manually by frequently visiting the roads and by visually inspecting for the surface distress. The data is collected using different measurement devices and the data is gathered from 50 lanes urban road, Pune city. Each lane is manually surveyed for 100m length and an average width of 3.5m. The distress are measured and recorded in the standard tabulated format of IRC [6]. Videos and pictures of the distress are recorded and the data is transformed to the tabulated form in the Microsoft excel and a complete data base is created for 50 lanes.

A. Distresses Analysis:

To make further comparison between IRC and HP methods, it is essential to conduct a distress wise analysis and compare whether both the methods gives the same result or not.

1. The distress wise analysis is shown in the appendix A. the distress wise matching and mismatching criteria between both the manuals have been determined. The following table shows the matching and mismatching criteria for the distresses based on IRC and WSDOT [4] distresses identification manuals for both severity and extent.

Table (1)

Matching And Mismatching Criteria By Percentage					
S.No	Distress Type	Severity		Extent	
		Matching %	Mismatching%	Matching %	Mismatching%
1	Patching	33.33	66.66	6	93
2	Raveling	60	40	23.33	76.66
3	Pothole	86.36	13.63	100	0
4	Alligator –Cra	85.71	14.28	100	0
5	Bleeding	100	0	100	0
6	Longitudinal – Cr	50	50	75	25
7	Transverse –Cr	100	0	100	0
8	Edge breakage	33.33	66.66	83.3	16.6
9	Shoving	11.11	88.8	77	22
10	Rock loose	70	30	100	0
11	Delamination	100	0	100	0
12	Segregation	66.66	33.33	16.6	83.3
13	Joint cracking	100	0	100	0
14	Checking	50	50	100	0

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The table (1) indicates fourteen types of common distresses observed in all of the 50 lanes. The summary of matching and mismatching criteria based on IRC and WDOT has been shown percentage wise. From the table it can be inferred that in case of severity and extent both the IRC and WDOT gives the same result in to some extent.

2. The graphical representation of the table (1) is as under:

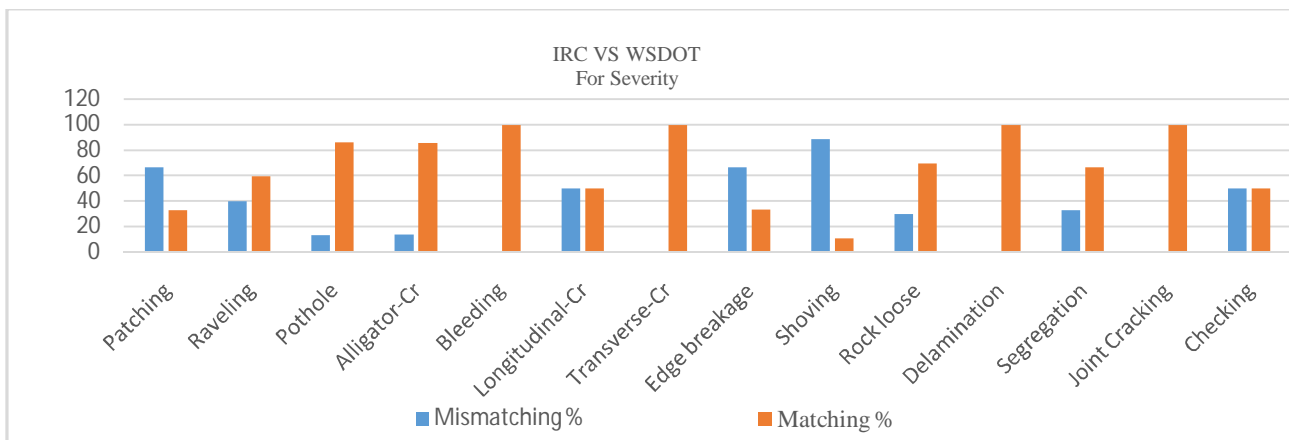


Figure 2: Distress wise matching and mismatching criteria of IRC and WSDOT distresses identification manuals for severity

Inference from figure (2) of severity is:

- Pothole, alligator cracking, bleeding, transverse cracking, delamination and joint cracking are the forms of distress that both the manuals give the same result for severity analysis.
- Raveling, longitudinal cracking, rock loose, and segregation are the forms of distress that both the manuals give confidential result for severity analysis.
- Patching, edge breakage, shoving and checking are the forms of distress that both IRC and WSDOT give the opposite result for severity analysis.

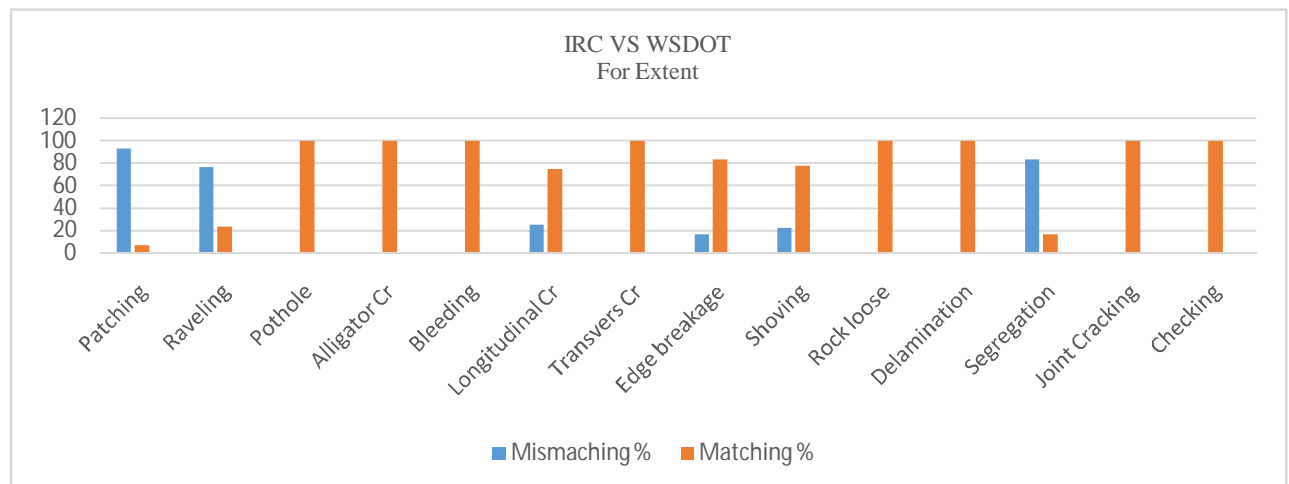


Figure 3: Distress wise matching and mismatching criteria of IRC and WSDOT distresses identification manuals for Extent

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Inference from the figure (3) of extent is:

- Out of all of the distress types for pothole, alligator cracking, bleeding, longitudinal cracking, transverse cracking, edge breakage, shoving, rock loose, delamination, joint cracking, and checking both the manuals give the same result.
- For ravelling, patching and segregation the manuals are giving opposite result.

V. FINDINGS AND CONCLUSION

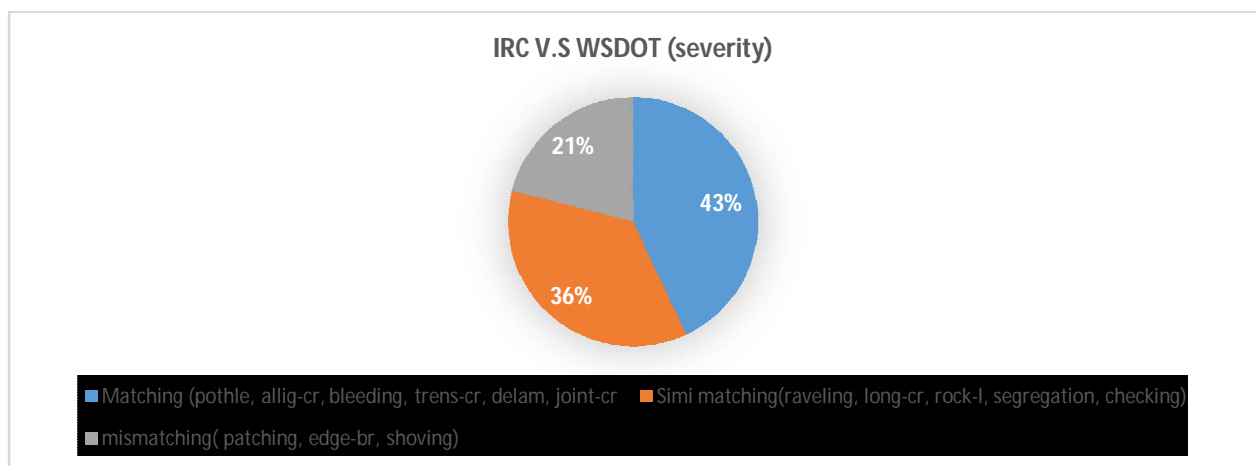
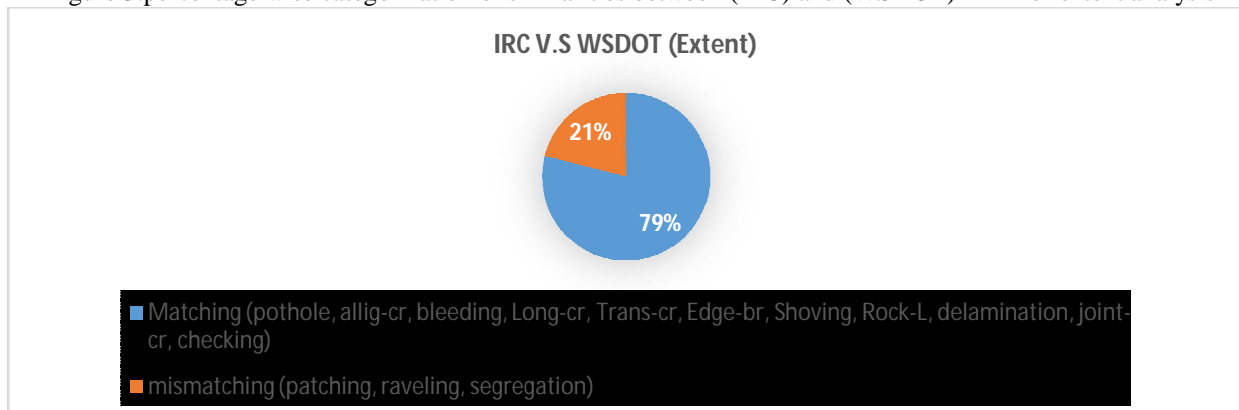


Figure 4: percentage wise categorization of similarities between (IRC) and (WSDOT) DIM for severity analysis

The figure (4) Indicates:

- Highly matching distress based on IRC and WSDOT distress identification manuals (DIM) are 43% and the DIM give the same result at the rate of 75% and above for this portion.
- Semi-matching distress based on IRC and WSDOT distress identification manuals (DIM) are 36% and the DIM give the same result at the rate of 50-75% for this portion.
- Mismatching distress based on IRC and WSDOT distress identification manuals are 21% and the DIM give the opposite result at the rate of 0-50%.

Figure 5: percentage wise categorization of similarities between (IRC) and (WSDOT) DIM for extent analysis



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Figure (5) Indicates:

- a. Highly matching types of distress based on IRC and WSDOT distress identification manuals (DIM) are 79% and the DIM give the same result at the rate of 50-100% for this portion.
- b. Mismatching types of distress based on IRC and WSDOT distress identification manuals are 21% and the DIM give the opposite result at the rate of 0-50%.

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