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FEASIBILITY STUDY OF ROAD CONNECTING VIMEET TO CHAR- PHATA (4-LEGGED INTERSECTION)

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Abstract - *In this paper, a simplified procedure for the assessment of pavement structural integrity and the level of service for rural road surfaces is presented.*

Road is an infrastructure that built to support the movement of the vehicle from one place to another for different purposes. As the improvement in road management system results in reduction of time and cost, in this the pavement condition index plays a big role in the pavement management. The pavement condition index (PCI) is a numerical index generally utilized for the assessment of the operational condition & structural reliability of pavements. The road safety aspects consist of mainly road markings & signs boards. As the maintenance and rehabitalization of the road is done by giving proper signs and markings on road. Estimation of the PCI is dependent on the results of a visual inspection in which the type, severity, and quantity of distresses are distinguished. In this research, a pavement distress condition rating strategy was utilized to accomplish the goals of this study. The main targets of this research were to categorize the common types of distress that exist from"(Vishwaniketan to Char-Phata)", and to estimate the pavement condition index. Using these data, Average PCI for the project road has calculated. PCI to assess the pavement performance as many types of defects were recognized in the pavement, as stated by the PCI method. Results indicated that the common pavement distress types were depressions, ravelling, Patching, potholes, bleeding, Longitudinal Cracking and alligator cracking.

Key Words: *Corrected Deduct Values (CDV); Pavement Condition Index (PCI), Road markings, sign boards.*

1. INTRODUCTION

The pavement condition and traffic speed are considered as operative and important factors that affect the efficiency of highway systems. The surface rehabilitation of multilane highways should be awarded a high priority by highway establishments, as this represents an important component of the road network. The Traffic speed is a significant factor because it determines safety, time, comfort, convenience, and economics, and is an important indication for predicting pavement condition and surface roughness of roadways, and the pavement condition index which saves the time and cost. This paper contains the feasibility check of the pavement condition/road surface of road connecting (ViMEET to char-phata).

As the project road comes under industrial & educational area, buses and Lorries are most running vehicles on this road. Hence our team has decided to deal with the feasibility check for road connecting VIMEET College to Char-phata, Khalapur. The type of road here is Two Lane Single Carriageway. The overall length of the road is 2.1 km with Carriageway width 3.8 m. The report details the method finding recommendations for feasibility study.

The functional evaluation has been based on various surveys & investigations which includes pavement condition & safety checks. To determine pavement condition index (PCI) procedure has been followed to identify and rate the distresses using ASTMD6433. Safety checks for road include road markings as well as road signs.

The road consists of village, school so the proper sign boards is must for the peoples nearby road.

In order to upgrade the road some codes and specifications are used as given below:

IRC 35:1997 (Code of practice) For Road Markings
IRC 67:2012 (Code of practice) For Road Signs
ASTMD 6433 for Pavement Condition Index
IRC: 99:1998 for speed breaker.

2. PAVEMENT CONDITION INDEX (PCI)

Pavement condition index (PCI) is a numerical rating of the pavement condition which ranges from 0 to 100 with 0 being the worst condition and 100 being the best.

Pavement condition rating is a description of pavement condition as a function of the PCI value that varies from "Failed" to "Good" as shown in Fig. 1.

A visual inspection of the pavement can provide valuable information. Visual inspection data can be used to evaluate the current condition, future performance of pavement, determine pavement needs. During a PCI survey, visible deterioration are measured and analyzed.

The final calculated PCI value is a number from 0 to 100, with 100 representing a pavement in good condition.

Fig 1 shows the PCI ratings. When interpreting the collected visual data, two different aspects of the collected data are of interest: the type of distress present and the rate of deterioration. The PCI value itself provides a basic idea of the pavement condition and maintenance required to rehabilitate the pavement.

Fig. 1: Pavement Condition Index (PCI), Rating Scale, and Suggested Colors

Pavements at the upper end of the scale are more likely to be candidates for minor rehabilitation, while those in the lower part are required structural rehabilitation or reconstruction. To evaluate a pavement, first of all, the pavement network should be divided into sample unit for individual inspection. A sample unit is any identifiable area of the pavement section. The steps for performing the condition survey and determining the PCI rating are conducted as per literature.

Methodology of PCI

1. Study sample unit, determine distress type and severity level and then measure the density.
2. The deduct values are determined from the deduct value curves for each distress type and severity.
3. A total deduct value (TDV) is calculated by summing all deduct values.
4. Once the TDV is calculated, the corrected deduct value (CDV) can be determined from the correction curves. When determining the CDV, if any individual deduct value is higher than the CDV, the CDV is set equivalent to the highest individual deduct value.
5. The PCI is computed using the formula PCI = 100 – CDV.

2.1 TYPES OF DISTERSS:

There are 19 distresses present in the flexible pavement. All distresses present in flexible pavement are:

- Alligator cracking
- Bleeding
- Block cracking
- Bumps and sag
- Corrugation
- Depression
- Edge cracking
- Joint reflection cracking
- Lane/shoulder drop off
- Long and transverse cracking
- Patching and utility cut
- Polished aggregate
- Potholes
- Railroad crossing
- Rutting
- Shoving
- Slippage cracking
- Swell
- Weathering

3. Road Safety Analysis

Road Safety Analysis (RSA) ensure prevention of loss of human life and damage to property which is a procedure to assess the safety standards of a road and helps in the overall decision making process of road management. Road are to be prioritized based on Safety levels to identify the most vulnerable roads to provide mitigation measures. The road safety standards includes Road Signs and Road markings which are given in detailed below

3.1. SIGN BOARDS

The type of sign designed to warn of hazards, indicate mandatory actions or required use of Personal protective equipment is known as safety signs as they, prohibit actions or objects, identify the location of firefighting or safety equipment, or marking of exit routes.

Safety signs are also found in public places and communities, at electrical pylons and Electrical substations, cliffs, beaches, bodies of water, on motorized equipment, such as lawn mowers, and areas closed for construction or demolition.

The main use of the Safety signs will need to be posted in hazardous areas, around dangerous machinery, by

emergency evacuation routes, on pipes, and many other areas around the workplace. A facility or safety manager should assess their workplace and identify hazardous areas with a job hazard analysis.

The main purpose of road signs is to promote road safety and efficiency by providing for the orderly movement of all road users on all roads in both urban and non-urban areas. As the Road signs notify regulations and provide warning and guidance needed for safe, uniform and efficient operation.

Nowadays, Roadway signs in the India increasingly use symbols rather than words to convey their message. The main use of Symbols that it, provides instant communication with roadway users, overcome language barriers, and are becoming standard for traffic control devices throughout the world. Familiarity with symbols on traffic signs is important for every road user in order to maintain the safety and efficiency of our transportation facilities. Functional evaluation of road signs should be done to determine at regular periodic intervals, whether certain signs need to be changed to meet current traffic conditions.

3.2. ROAD MARKINGS

Any kind of device or material that is used on a road surface in order to convey official information is known as the road markings; they are commonly placed with road marking machines (or road marking equipment, pavement marking equipment). Road markings also be applied in other facilities like parking spaces or designate areas for other uses.

Road markings are basically defined as lines, patterns, words or other devices except signs, set into applied or attached to carriageway or to objects within or adjacent to carriageway, for controlling, warning and guiding and informing users.
For guidance and information to drivers and pedestrians road markings plays a very important role. A continuous road marking on road is an important factor in minimizing confusion and uncertainty about their meaning, and efforts exist to standardize such markings across borders. As the different countries and different areas categorize and specify road surface markings in different ways .In road markings on of the white lines are called white lines mechanical, non-mechanical, or temporary. The use of this line is to delineate traffic lanes, inform motorists and pedestrians or serve as noise generators when run across a road, or attempt to wake a sleeping driver when installed in the shoulders of a road. Road markings can also indicate regulation for parking and stopping and for many other uses.

There is continuous effort to improve the road marking system by different countries or different areas, and technological it includes the new designs, innovations, ideas behind every signs and lowering the installation cost of that signs.

Today, to convey a range of information to the driver spanning navigational, safety and enforcement issues leading to their use in road environment understanding within advanced driver-assistance systems road markings are used. In traffic management road markings plays an important role. They should convey the required information to the driver without distracting his attention from the carriageway.

The project road is a type of Single Lane Two Carriageway. As also the project road comes under industrial area road markings are essential part of safety. Hence, according to the specifications for rural roads some of the road markings are provided and some of them are needed to provide.

4. OBJECTIVES

- To evaluate PCI value for the existing road section connecting ViMEET to Char-Phata and to suggest any required maintenance.
- To conduct road safety analysis and design for improvement in safety and efficient travel.
- To estimate the dynamic PCI values and to classify the different distress types.
- To evaluate the different safety standards (signs and markings) for road according to the needs of road.

5. METHODOLOGY

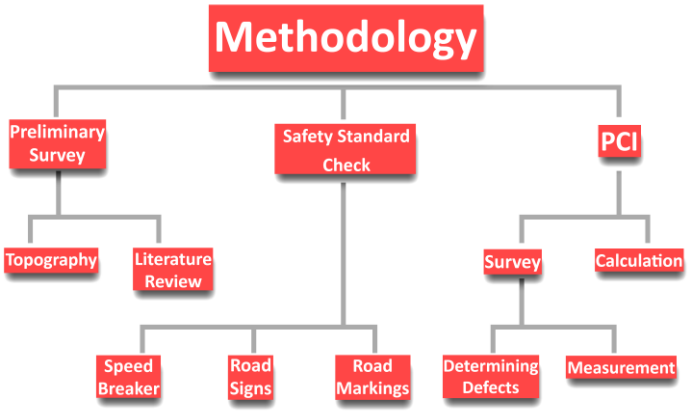

Fig. 2: Pavement Condition Index

6. SURVEY

Survey was done by visual investigation method. The survey for project road was divided into 3 parts as Pavement condition index (PCI), road safety analysis & traffic analysis. From survey we concluded that 6 types of distresses were found on the project road with low to medium severity. On the other hand, as sign boards and road markings were prioritized less, this shows that safety was not considered of more importance while constructing the road. Hardly 2 to 3

sign boards and enough markings were provided. Some of the markings were disappeared at the edge of Carriageway.

6.1 SIGN BOARD CHECK

Sr. No	Sign Boards		Chainage (in m)	Availability
	Name	Image	ViMEET-Char-Phata	Yes/No
1	School Ahead		60	No
2	Pedestrian Crossings		2	Yes
3	Speed Limit		200	No
4	Pedestrian Crossings		765.33	No
5	Speed Limit		1110	No
6	Major Road Ahead		2040	No
7	Stop		2098	Yes

Table 1: sign board availability check

6.2 ROAD MARKING CHECK

Sr. No	Road Markings		Availability
	Name	Image	Yes/No
1	Border/ Edge Lines		Yes
2	White Broken Continuous Lines		Yes
3	Straight, Right & Left Arrow		No
4	Pedestrian Crossing		No

Table 2: Road Markings availability check

7. CALCULATIONS

Now, when, the condition Survey has been completed, the results are used to estimate the PCI. The PCI calculation is established on the deduct values weighing factors from 0 to 100 that specify the impact, each distress has on pavement condition.

Calculation of a Sample Unit PCI
During the process of pavement condition survey, the distress quantity and intensity of each distress type observed were measured in accordance with the distress definitions and procedures for asphalt surfaced roads. The calculation steps for asphalt surfaced pavements are shortened in Figure 5. Following is an explanation of each step.

Step 1: Determine deduct value
Length of Road (2.1 km) = 2100 m
Width of Road (3.8 m) = 3.8 m
Total Road surface area 3.8×2100 = 7980 Square mt

DISTRESS DENSITY	QUANTITY			TOTAL	DENSITY %	DV
10L	0.54	0.275	0.18	0.995	0.012	0
1 M	0.418	0.708		1.12	0.014	0
11M	1.89	6.09		7.98	0.1	3
13M	8			8	0.1002	2
19L	0.940	0.95		1.89	0.023	0
6M	0.28			0.28	0.003	0
2L	0.16			0.16	0.002	0

Table 3: Flexible Pavement Condition Survey Data Sheet

Highest deduct value (HDV) =3

Step 2: Determine Max Allowable No of Deducts (m)

m = 1+ (9÷98) (100-HDV)
= 1+ (9÷98) (100-3)
= 9.98
Deduct value in descending order = 3,2,0,0,0,0,0
No. of deduct value = 7

Step 3: Determine Max Corrected Deduct Value

Corrected deduct Value (CDV)-
No. of deduct value greater than 2 & q=2

Total deduct Value = 3+2 = 5

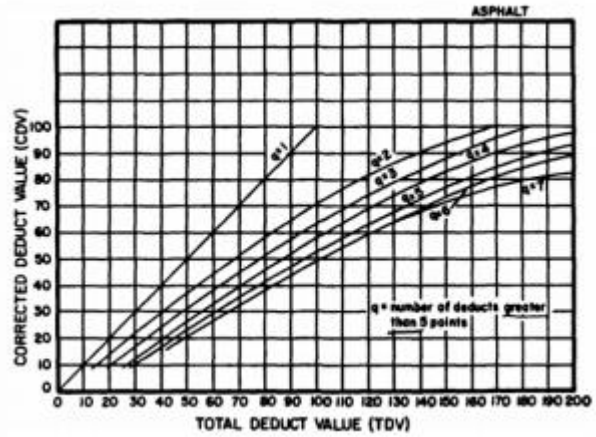

Fig. 3: Corrected deduct value curves for asphalt-surfaced pavements

From graph, CDV = 0

Reduce the smallest individual deduct value to 2 & determine CDV. Repeat until q reach 1.

No.	Deduct Value		Total	q	CDV
1	3	2	5	2	0
2	3	2	5	1	5

Table 4: CDV sheet for calculation of PCI

Maximum CDV=5

Step 4: Calculation of PCI

PCI = 100-Maximum CDV
= 100-5
= 95

The PCI value of Road = **95**
Rating - **GOOD**

8. IMPROVEMENTS

To enhance the safety of road users an adequate provision of sign boards and markings have been proposed.

- ✓ Speed breakers, which are essential part for the project road, must be provided. The road is about 2.1 km since not a single breaker is provided. We have suggested standard design of speed breaker at 4 positions some at villages, college and lastly at major road.
  DESIGN:
  Rounded hump: 1.7m radius
  3.7m width
  0.10m height
- ✓ 9 sign boards & 4 road markings have been suggested and are given in the table format below:

Sr. No	Improvements		Chainage (m)
	Name	Type	From ViMEET to Char-Phata
1	Pedestrian Crossing	Road Marking	2
2	Speed Breaker	Geometrical Element	5
3	Hump Ahead	Sign Board	45
4	School Ahead	Sign Board	60
5	Speed Limit	Sign Board	200
6	Hump Ahead	Sign Board	605
7	Speed Breaker	Geometrical Element	645
8	Pedestrian Crossings	Road Marking	765
9	Pedestrian crossing Board	Sign Board	765
10	Speed breaker	Geometrical Element	1030
11	Hump Ahead	Sign Board	1070
12	Speed Limit	Sign Board	1110
13	Major Road Ahead	Sign Board	2040
14	Hump Ahead	Sign Board	2090
15	Pedestrian Crossing	Road Marking	2095
16	Pedestrian crossing Board	Sign Board	2095
17	Straight, Right & Left Arrow	Road Marking	2100

Table 5: Improvement Sheet

9. CONCLUSIONS

In this study an attempt was made to evaluate major traffic on the road connecting ViMEET to old expressway (char-phata), by visual inspection method.

It has been found that the rating for the road was 'Good' with PCI=95.Based on determined rating, the suggested

maintenance for pavement section is continuation of existing maintenance policy.

The distresses found on the project road were of 6 types: longitudinal cracking, alligator cracking, patching, potholes, ravelling, and depression.

The analysis of signs and safety devices denotes the need to implement preventive markings and safety barriers to avoid accidents.

9 sign boards and 4 road markings have to be provided on the project road.

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