

EVALUATION OF ROAD CONSTRUCTED UNDER PMGSY SCHEME AND THEIR SOCIAL BENEFITS – A CASE STUDY OF ANAND DISTRICT

¹Abhishek R Shah, ²Dr.L.B. Zala, ³Prof. Amit. A. Amin

¹ PG Research Scholar, ²HOD, Civil Department, ³ Assistant Professor

¹Transportation Engineering Department,

¹BVM Engineering College, Anand, India

Abstract: The government of India has launched “Pradhan Mantri Gram Sadak Yojana” to provide connectivity to rural roads of the villages. As India is a county of villages huge investments are made to provide roads of all-weather conditions to the rural areas. The roads are constructed with high quality control during the construction, maintenance of these roads is given less attention because of this the life of the road are going short. Out of the total road constructed in India 70.23% road are rural roads. The Central Government has launched the Scheme Pradhan Mantri Gram Sadak Yojana (PMGSY) on 25th December 2000. The primary objective of the PMGSY is to provide connectivity, by all for all all-weather road, with necessary culverts and cross-drainage structures, which is operable throughout the year. The aim of the study is Evaluation of Road Constructed Under PMGSY Scheme and Its Social Benefits – A Case Study of Anand District. The objectives of the study are as follows: To assess the present condition of the pavement using Pavement Condition Index (PCI), to determine maintenance type, to determine the deflection of existing flexible pavement using Benkelman Beam deflection, to assess the overall socio-economic impact on the lives of the rural people as the part of the PMGSY The study purposes the methodology is to evaluate the PMGSY road and their social benefits. The study had two major and critical goals which covered by considering the following three tasks; the first was the visual evaluation and inspection of existing flexible pavement conditions including the failures, the second to determine and find out the actual causes of these failures in the pavement, and the third is to select the most and inspection of existing flexible pavement and maintenance types.

Key Words: Visual evaluation, inspection of existing flexible pavement, maintenance types, distress type.

I. INTRODUCTION

The roads are important asset for any nation. Development of good road infrastructure leads to social and economic development of a country. Road development are directly proportional to the prosperity of the country. The investment done in this sector can't be seen directly but can be seen over some long period of time. India has the second largest highway and road network system in the world. Road network in India has expanded from 0.4 million km in 1951 to about 5,603,293 kilometers (3,935,337 miles) as on 31 March 2016, a fourteenfold increase, but traffic has increased 120 times. The total length of low volume village roads in India amounts to approximately 3,935,337km that is 70.23% of total road network (2016). Compared to other road categories, traffic volume on most village roads is very low (with less than 450 commercial vehicles per day). The Central Government has launched the Scheme Pradhan Mantri Gram Sadak Yojana (PMGSY) on 25th December 2000. The primary objective of the PMGSY is to provide Connectivity, by way of an All-weather Road (with necessary culverts and cross-drainage structures, which is operable throughout the year), to the eligible unconnected Habitations in the rural areas, in such a way that all Unconnected Habitations with a population of 1000 persons and above are covered in three years (2000-2003) and all Unconnected Habitations with a population of 500 persons and above by the end of the Tenth Plan Period (2007). The scheme is fully funded by the Central Government. Under PMGSY Scheme the Government planned to provide connectivity of 1,78,184 habitations and it reached 1,52,124 habitations by 2016 (which is 85.37% against 1,78,184 eligible habitations). Sensing the importance and urgency of rural roads for national development the target date for completion of PMGSY-I has been preponed from 2022 to 2019.

II. OBJECTIVES

The main objectives of the research is to determine the structural evaluation and PCI and also present condition of pavement with socio- economic viability of PMGSY road of selected stretch.

III. LITERATURE

A. General

Soon after the road is allowed to traffic pavement starts deterioration. This deterioration and failure of pavement is a complex, as it involves several factors contribute for deterioration. The type and extent of rural road maintenance activity required depends on the maintenance needs, availability of funds and priorities for the maintenance option. At present the maintenance of PMGSY roads up to five years from the date of construction is done by contractor, but this maintenance is based on % amount allocated for the road per year, no pavement evaluation is done before taking the maintenance activity for the road. And the older roads which are completed the maintenance period are not given any importance for maintenance. Therefore, rating of the road and proper evaluation technique will help the engineer to assess the present condition of the road and amount require for the maintenance.

B. Literature Reviews

Study done by K. Kiran Kumar and Dr. S.N. Suresha (2012), aims at assessing the pavement condition index of the road and to suggest some appropriate maintenance solution. The study is based on three things: based on visual inspection, based on riding comfort, based on driving speed.

Study done by Abhay Tawalare, K. Vasudeva Raju (2016), researched about the pavement performance index for the rural road. The distress is identified in from literature reviews. The various distress ratings were also taken from literature review. Final selection of distress parameters was taken under opinion of five experienced industrial expert.

Study done by Mr. Jay J. Parekh, Dr. Yogesh U. Shah (2016), total 5 road stretches for research with 6km length were selected, which both structural and functional evaluation are to be performed. Parameters like pavement serviceability index, road class, road quantity, traffic volume are to be considered. Questionnaires were prepared and weightage were giving under the expert guidance using expert guidance. Surveys like traffic count, condition survey, roughness survey, structural survey are to be done to evaluate the road.

Study done by K. Rajkamal, T. Dinesh Reddy, D. Rohith, Venkaiah Chowdary and C.S.R.K. Prasad (2016), the performance of the road sections was evaluated in terms of roughness, skid resistance, and texture depth. The initial set of data was collected immediately after construction and one month after construction. Later, four sets of pavement performance data were collected after seven months of construction of the surface dressing layer.

C. Pavement Condition Index

Pavement condition index are of two types they are 1). Visual rating. 2). photo/ video observation rating in visual rating the main mode of data collection would be through visual observation made by the observer walking along the road path. The PCI rating can also be calculated using the deduct value graph and the equation for the PCI rating is given as $PCI=100-CDV$

Where, CDV= Corrected or Normalized Deduct Value

Table 1- Pavement Condition Ratings

PCI	Pavement Condition
85 – 100	Good
70 – 85	Satisfactory
55 – 70	Fair
40 – 55	Poor
25 – 40	Very Poor
10 – 25	Serious
0 – 10	Failed

D. Benkelman Beam Deflection

The survey is carried out to detect the rebound deflection of pavement which is used to determine the overlay thickness of existing flexible pavement. For using the Benkelman Beam deflection various other different parameters are to be taken into consideration like temperature, moisture content and type of soil, but as per IRC: 81-2004, correction factors are required to be applied as temperature and moisture content are not always as per the given guidelines. Thus, deflection is calculated after considering after applying the correction factor. Formula for calculating the rebound deflection

1. If $D_{Intermediate} - D_{Final} \leq 0.025$ mm and D

$$\text{Actual deflection } XT = 2 (D_{Initial} - D_{Final})$$

2. If $D_{Initial} - D_{Final} > 0.025$ mm,

$$\begin{aligned} \text{Actual deflection } XT &= XA + 2.91 Y \\ &= 2(D_{Initial} - D_{Final}) + 2.91 [2 (D_{Final} - D_{Intermediate})] \end{aligned}$$

3. Rebound deflection = $2 * XT$

E. Overlay Design

The overlay design can only be known once when the Benkelman beam survey is performed on the selected road. Based on the different survey performed on the road stretch like condition survey which determine the PCI index than soil investigation survey gives the characteristics of the soil and Benkelman beam survey is concern with the deflection of the pavement. The Benkelman beam survey has been performed as per the IRC-81: 1997, using its guidelines the overlay design of the existing road stretch is to be proposed

There is various parameter that are considered in designing of overlay. Parameters like moisture content, traffic flow (CVPD) and temperature correction factor.

The traffic data can be calculated with the help of formula mentioned below:

$$N_s = \{365 * A [(1 + r)^x - 1]\} * F / r$$

Where,

N_s = The cumulative number of standard axles to be catered for in the

A = Initial traffic, in the year of completion of construction, in terms of no. of commercial vehicles per day duly modified to account for the lane distribution

r = Annual growth rate of commercial vehicles

x = Design life in years

F = Vehicle Damage factor.

The overlay that is required to be done can know from the below mentioned graph by knowing characteristics deflection and multi standard axle.

F. Road Inventory Survey

The road inventory survey is mainly used to assess the physical characteristics and visual condition of the road. The detailed survey has to be carried out on the selected stretches.

G. Maintenance Type

Once the PCI ratings are given, we can know that which type of maintenance should be given to the road so that its service life can be increased.

Table 2- PCI Ranges and Maintenance Intervention

PCI	Rating	Type of Maintenance
80 – 100	Very Good	Preventive
60 – 80	Good	Resurfacing
40 – 60	Fair	Overlay
20 – 40	Poor	Strengthening
0 – 20	Very Poor	Rehabilitation

H. Stretch Details

Table 3- Stretch Details

Name of section	Starting point	Ending point	Length (km)	Width of carriageway	Shoulder width	Median
Napad-Prakashnagar	Napad village	Prakashnagar	1.4	4.30m	0.3m	-
Napad Tadpad – Lalpura	Napad village	Lalpura village	2.50	4.40m	0.3m	-
Napad Tadpad-Indira Nagari	Napad village	Indira Nagari village	3.00	4.00m	0.2m	-
Dahemi-Napad	Napad village	Dahemi village	4.00	4.00m	0.2m	-

I. Socio- Economic Survey

In this a questionnaire is prepared which has total 16 question and were ask to the people living near the selected stretches It mainly deals with the boost that has taken due to the development of the road.

IV. DATA COLLECTION

A. Road Inventory Survey

In the road inventory survey, the data are taken by the visual inspection which are used to know the road general characteristics such as length, width, shoulder, drainage.

B. Pavement Condition Index

The data collected for PCI is based on both photography and visual inspection. The PCI is once calculated, the road ratings can be given with the help of deduct value graph.

C. Benkelman Beam Deflection

The BBD survey is performed to know the actual deflection of the road so that the required overlay or the maintenance can be provided to the road to increase the service life of road.

D. Maintenance Type

Once the PCI ratings are calculated, by using the same rating the maintenance type will be decided.

E. Overlay Design

For knowing the thickness of overlay required on the road, Benkelman Beam Deflection is performed and from the we obtain characteristics deflection which helps in deciding the overlay thickness.

F. Socio Economic Survey

A set of questionnaires are made and while performing the survey work the questionnaire survey is done side by side by asking the residential living over.

V. DATA ANALYSIS AND RESULTS

PCI Ratings and Maintenance type

Table 4- PCI Ratings and Maintenance type

Napad- Dahemi Road

Chainage		PCI (value)	PCI (ratings)	Types of Maintenance
From	To			
00/000	01/000	49	Poor	Strengthening
01/000	02/000	54	Poor	Strengthening
02/000	03/000	63	Fair	Resurfacing
03/000	03/900	57	Fair	Overlay

Napad – Prakashnagar Road

Chainage		PCI (value)	PCI (ratings)	Types of Maintenance
From	To			
00/000	01/000	49	Poor	Strengthening
01/000	01/400	56	Fair	Overlay

Napad - Lalpura Road

Chainage		PCI (value)	PCI (ratings)	Types of Maintenance
From	To			
00/000	01/000	9	Fail	Rehabilitation
01/000	02/000	5	Fail	Rehabilitation
02/000	2/500	45	Poor	Strengthening

Napad - Indiranagar Road

Chainage		PCI (value)	PCI (ratings)	Types of Maintenance
From	To			
00/000	01/000	17	Fail	Rehabilitation
01/000	02/000	13	Fail	Rehabilitation
02/000	03/000	35	Very Poor	Strengthening

Overlay Design Result

1. Napad Dahemi road requires overlay of 93mm at chainage 3/000km- 3/900km on the LHS side and requires an overlay of 70mm on chainage 1/000km- 3/000km.
2. Napad Lalpura road requires overlay of 90mm at chainage 0/000km- 2/000km on the LHS side and requires an overlay of 100mm and 70mm at chainage 0/000km- 1/000km and 1/000km to 2km respectively.
3. The other two roads Napad Indiranagar and Napad Prakashnagar do not require the overlay.

Socio- Economic Survey

From the survey performed it has found that the villages are benefitted with the road and it has helped in increasing the income, transport facility, educational level and decreased their travel time.

VI. CONCLUSION

1. On the Napad- Lalpura road it can be seen that the PCI rating shows failed pavement so it is required to be rehabilitation or an overlay of 100mm is required to be done.
2. On the Napad- Dahemi road it can be seen that the PCI rating shows both poor and fair pavement so it is required to be strengthen and resurfaced with an overlay of 93 mm thick surface.
3. On the Napad- Indiranagar it can be seen that the PCI rating shows fail and very poor pavement so it is required to have rehabilitation and strengthen.
4. On the Napad- Prakashnagar road it can be seen that the PCI rating shows poor and fair pavement so it is required to have strengthen and overlay.
5. From the socio-economic survey it can be seen that the road has boosted up their economy.

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