# Improvement of Road Widening & Strengthening From Top To Arwade SH-151: A Review

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***Abstract-*** *Transportation infrastructure plays a lead role in economic growth and development of country. The road transport is the ancient and perhaps the most widely adopted mode of transport of mankind. The road transport witnessed a tremendous growth rate after independence of our country. Pavements are the key elements of infrastructure of the country, whose functions are to promote transport activities, economic activities and to improve the standard of living. Flexible pavements undergo the functional deterioration as well as the structural deterioration simultaneously due to the combine effects of climate, environment and traffic loads. The functional deterioration is also indicated by the changes in surface condition of the pavement in the form of distress in the quality, which can be measured by simple methods it is also possible to restore the surface to original condition of the pavement by providing a profile correction course and a re-surfacing the layer and Widening and strengthening of the existing pavement. The high growth number of vehicles will increase the movement and the use of transport infrastructure. Road widening is one of the actions that can be used as the solution. However, this solution also increases the traffic performance. This is because people will switch to use the newly widened and resurface road because they believe this road can accommodate the existing and future traffic volume. For finding out the effects of road widening and strengthening towards the increasing of traffic performance and road capacity, it is necessary to conduct a research and an analysis. The road network of any city is its lifeline and the evaluation of their performance is very necessary for future traffic planning, design, operation and` Maintenance, etc. Traffic flow in most cities of India is a mixed traffic characteristic and also the traffic congestion is the common problem in most major cities in India.*

***Keywords***- Pavement, CBR, Traffic Survey, Traffic Projection

## I. INTRODUCTION

### 1.1 Site Overview

The Government of Maharashtra through Public Works Department, entrusted to the Authority the Improvement, maintenance and management of State Highway No.151 "PN-43- Improvements to Top Wadgaon Shigaon Aashta Tasgaon Bhivghat Atpadi Dighanchi Road, SH - 151, Km 0/000 to 127/950, District Sangli (Part I -Top to Arwade Km 0/000 to Km 63/000) on HAM."

The scope of the project in PN-43 is Improvement to Top Wadgaon Shigaon Ashta Tasgaon Bhivghat Atpadi Dhighachi Road, SH-151, Km 0/000 to 127/950 (Part I- Top to Arwade Km 0/000 to Km 63/000) on Hybrid Annuity Basis. The main objective of the project is design of flexible pavement for widening carriageway, strengthening of existing carriageway, reconstruction of failed sections, if any.

We conduct necessary field investigations and suggest suitable value Engineering for project PN-43-Improvement to Top Wadgaon Shigaon Ashta Arwade Bhivghat Atpadi Dhighachi Road SH151, km 0/000 to 127/950 (Part I- Top to Arwade Km. 0/000 to Km 63/000) on Hybrid Annuity Basis.

### 1.2 Benkelman Beam Deflection Survey

Benkelman Beam deflection survey is carried out for evaluating residual strength of the existing pavement and assessing the strengthening requirements for the pavement. BBD test have been conducted as per C.G.R.A. method described in IRC: 81-1997.

Since the existing highway is of two-lane carriageway, it was assumed that each of the km stretch as homogeneous section and decided to have BBD deflection measurements at 20 observation points for every km length of the stretch. For better understanding of the pavement structural strength, BBD test was conducted such that, 10 observations were taken on LHS and the remaining 10 observations were taken on RHS of the carriageway in staggered manner. However, the stretches showing distress with excessive rutting, potholes and ravelling were identified and rejected for

BBD test as they do not reflect the correct deflection values. Two teams with complete set of equipment and accessories were engaged to take the deflection observations all along the project stretch. Following procedure was adopted during the test as per IRC: 81

**1.3 . Marking for BBD Test**

BBD observation points were marked at a distance of 0.9m from BT edge (pavement edge). Two more similar points were taken at distances of 2.7 m and 9.0 m longitudinally from the first point at same transverse distance of 0.9 m from pavement edge and marked with paint. The three points thus marked became a set of points for one observation location. The process of marking set of three points at an interval of 50 m for 10 observation points along the LHS and 10 observation points along the RHS along the project stretch is repeated. After marking the deflection observation points the studies shall be carried out in the following steps: -

The truck is loaded with a rear axle load of 8170 kg and the rear dual tyre is set into inflation pressure of 5.6 kg/cm2.

The truck was slowly driven parallel to the edge and stopped such that the left side rear dual wheel is centrally placed over the first point for deflection measurement.

The probe end of the Benkelman Beam is inserted between the gaps of dual wheel and placed exactly over the deflection observation point, ensuring that the probe touches the pavement surface.

The initial dial gauge reading (Do) is noted when the dial gauge reading is stationary (or) when the rate of change of pavement deflection is less than 0.025mm per minute. Both the needles of dial gauge are set to zero-zero before fitting it to BBD instrument and locked. The readings of both the needles of dial gauge and noted down in specified format. (The least count of the large needle is 0.01mm & that of small needle is 1.0 mm)

After taking initial reading, the truck is moved forward slowly through a distance of 2.7 m from the point and stopped. When the rate of recovery of pavement is less than 0.025 mm per minute the intermediate dial gauge reading (Di) is noted down. The truck is drive forward through a further distance of 9.0 m and the final dial gauge reading (Df) is noted down, when the rate of recovery of the pavement is less than 0.025 mm per minute. The three deflection dial readings Do, Di and Df forms a set of readings at one deflection point under consideration. Similarly, the truck is moved forward to the next deflection observation point, such that insertion of the probe of Benkelman beam and procedure of noting the set of three deflection observations shall be exactly the same as explained above and repeated the same procedure at all deflection observation points. The temperature of pavement surface is also recorded with the help of thermometer by making a hole of 10-mm diameter, 45mm deep in existing B-T surface filled with Glycerol.

Variability of deflection in a given section was considered for deleting spots where extra deflection measurements have been made. For this purpose, highest and lowest values in a group of ten was compared with mean value. Whenever the highest and lowest values differ from the mean the mean by more than one third mean then extra deflection. Measurements were made at 25mm on either side of point where high or low values are observed.

## II. STATE OF DEVELOPMENT

**BHAGAT KUNAL P, et.al (2015)** in this literature flexible pavement overlay design was carried out as per IRC: 81- 1997 -Guidelines for Flexible Road Pavement Strengthening using Benkelman beam deflection (BBD) technique. The design thickness is designed as per the evaluated of Benkelman beam deflection is 90 mm of bituminous layer. They have done overlay design as per IRC: 37-2012 base on fatigue and rutting failure of criteria. The various inputs required for the design is computed with the deflection & existing pavement layer thickness as per IRC guidelines. The design is checked with the software of IIT-PAVE for horizontal tensile strain computed at the bottom of layer of bituminous and vertical strain at sub-grade on top. The computed fatigue & rutting strain is 0.0837 micron and 169 micron due to material, which is the lower than strain due to traffic so that the overlay design found safely in both criteria.

**MAHENDRAKAR KIRAN KUMAR, et.al (2015)** in this Research they have studied on a factor, which causes further concern in Indian is very high and very low pavement temperature in some parts of the country. Under this condition, flexible pavement tends to become soft in summer and brittle in winter. Further increase in road traffic since the last 10years with an un-duly low level of maintenance has contributed to accelerated damage of road surfacing. To prevent this deterioration process, several types of measurements may be adopted effectively such as improved design use of high performance material and effective construction technology. Over the last 20 years, traffic volume and the percentage of heavy truck traffic have increased enormously on the national highway - 18. This pavement is a flexible pavement with bituminous surface.

**DHAVAL V. LAD, et.al (2015)** in this structural evaluation of flexible pavement deflection by the Benkelman Beam is measured. Re-bound deflection is used for overlay design. A detailed pavement condition survey is done on State Highway 158 (Waghodiya crossing to Limda) and the road condition is evaluated structurally. Their present study is evaluates the overlay thickness for State Highway 158 Waghodiya is crossing to Limda.

This studied method in they have carried out visual survey and structural survey. In visual survey find Rutting, Patching and Pot-hole and in structural survey find deflection by Benkelman beam deflection test.

**UMERSALAM, et.al (2015)** in this research they have focus on need of pavement evaluation and pavement evaluation measures for the road pavements of urban areas in Kashmir. The collection of required field data such as sub grade data of soil, existing pavement structure, traffic data, surface condition of pavement and rebound deflection by using BBD technique, laboratory investigation is finally the design of the overall thickness of the road pavement and overlay what so ever required to strengthen the road stretch. In this given compassion between newly propose thickness and existing pavement thickness.

**C.C. Bhattacharya** considered safety as a key objective and introduced traffic calming techniques. The sole idea for this study is to enforce a speed control to 15 to 20 km/hr., which is considered as a safe speed of travel. Methods performed and designed in this study are changed in street alignment, installation of barriers and installation of other traffic control devices as the situations demands. Reduction in number and severity of accidents, improve facilities for non- motorized modes, increased in property values etc. are the benefits of traffic calming

**P.K Sahooet.et al** conducted a study on traffic flow characteristics which included traffic speed, volume, density, etc. on two stretches of national highway No – 5 touching Bhubaneswar , capital of Odisha. The field study was carried out for 1km length on each stretches. The first stretch was between Bhubaneswar to Cuttack and the second was between Bhubaneswar and khurda. The experiments were conducted between the average peak periods on week days. The traffic densities and vehicular speeds were observed through regression equations. The speed – flow relationships were drawn and concluded that the speed decreased with the increased in volume. On the Bhubaneswar –Khurda stretch at a traffic volume of around 750 veh/hr, the lowest average speed is 30 kmph and 33 kmph on the Bhubaneswar – Cuttack stretch at about 850

## III. CONCLUSION

1. As the traffic is increasing day by day in state highways and most of the highways width is around 7 mts i.e. two lane with earthen shoulders but with this widening and Strengthening work methodology with the minimum budget we can reconstruct road with earthen shoulder and embankment, Subgrade & granular layers and convert this earthen shoulders in to paved shoulders so that the width of the carriage way will be 10mts with 1 mts earthen shoulder on both sides so that the formation width of the road will be 12 mts.
2. Due to Widening of carriage way so it can accommodate more traffic and by strengthening the existing pavement with BM, DBM and BC will increase the strength and maintain the profile of the road with minimum maintenance cost.
3. With this methodology we can minimise the financial impact of the project with good quality and increased road life.
4. As the carriage way width increases hassle free traffic moment which leads to save time and fuel cost.
5. As the access increases the industrial and commercial market is developed so the commercial growth of the town and local farmer's standard of living will increases.
6. As its sugar cane belt so the moment of traffic will be smooth and less chances of road accidents.
7. By widening and strengthening of Existing Pavement we are adopting and continuing the practice of Value Engineering.

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