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## Road Safety Audit and Pavement Evaluation

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**ABSTRACT:** Road safety audit is formal procedure for assessing accident potential and safety performance in the provision of new road schemes, the improvement and rehabilitation of existing road and also in maintenance of roads. The role of auditor is to provide independent advice and recommendations in the form of written. The primary role of audit team is to identify the potential problems of a highway project by conducting the site inspection and various surveys and collecting data from various agencies. The objective of the study is the identification of accident prone areas on the road from FIR, to study the effect of roadway geometrics design of roads and traffic conditions on the road stretch and development of statistical relationship between rate of accident and various factors causing accidents. The scope of the study is to reduce accidents on road network, reducing severity of accidents and the need for costly remedial work is reduced. The road selected for the study is Kolhapur Sangali Highway (from Shiroli phata to Sanjay Ghodawat University) (11 km). The accident analysis is done from four years data. The other process used is making some bitumen content test of present road and Beam Deflection Test.

**KEYWORDS:** Tests, Road survey, Structure reports, Pavement evaluation, Material tests

### I. INTRODUCTION

The Road Safety Audit (RSA) process started in 1980's in the UK, moved to Australia and New Zealand in 1990s, and this was introduced in USA at the mid -1990s. A wealth of experience of audit has been gained since 1990 in the UK to till. Road Safety Audit has been taken up in major way in Australia and Newzealand where Austroads Guidelines have been published and in Denmark where road safety audits are mandatory to for all national highways. Now, the World Bank has made it mandatory that all World Bank aided highway projects would be audited from the road safety point of view.

### II. ROAD SAFETY IN INDIA

In India, at present there is no formal requirement for road safety audits to be undertaken. However, India has also started realizing the importance of road safety audits. It is because of Ministry of Road Transport and Highways sponsored the project on "Development of Safety Audit Methodology for Existing Roadway Sections" to Central Road Research Institute in April 2002. Now a day road safety is more important for safety purpose of people The total length of these 15 packages was about 900km which was the longest road project for which Road Safety Audit has been carried out throughout the world. Also, first RSA was carried out again by CRRI in 2000 on Indore Bypass. It is understood that the entire National Highway Development Project will be considered to RSA as part of its implementation. However it is to be recognized that RSA are to be under taken all types of roads.

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## III. OBJECTIVES OF THE STUDY

Each accident calls for systematic study in a scientific manner and detailed investigation of the accident spot. This type of investigation will help to identify some of the causative factors responsible for accidents and to give relative importance. The results of the study can be employed advantageously to take preventive measures to reduce the rate or quantity of accidents. The objectives of the present study are

- Identification of accident prone areas on the proposed Sangli –Kolhapur Highway.
- To study the effect of roadway geometrics and traffic conditions on this road stretch.
- Development of statistical relationship between accident rates and various factors causing accidents.
- To determine deflection of road and give suggestions on that.

## IV. LITRETURE REVIEW

YuhaHuvarinenetal- Road Safety Audit, "Organization and Traffic Safety Management in the Large Cities", Spbotsic-2016, 28-30 September 2016, at St. Petersburg, Russia. The article showed that observance of automobile roads design and construction standards does not guarantee safety of traffic. It studied the experience of the leading countries in the field of the traffic safety audit integration into technological processes of roads lifecycle. It had given the key features of the traffic safety audit methods and the model of its application in terms of the Russia/Finland project for the development highways for enhancing traffic safety in the Leningrad Oblast by the experts

ZarulazamEusofe et al. Assessment and valuation of Road Safety Management at Institutional Level in Malaysia, IATSS Research This paper had examined the current institutional arrangements for the management and safety of rods in Malaysia in a systematic manner. It focused on road safety funding and seemed to provide an insight into how funding factors may affect both the effectiveness and the efficiency or road safety management. The study followed an exploratory approach based on semi-structured interviews targeting key stakeholders in road safety management such as policy makers from various government agencies, private sector representatives and academia

Francis John Gichaga, The Impact of Road Improvements on Road Safety and Related Characteristics This paper presented the historical and cultural background relating to road improvement and road safety characteristics in Kenya. It discussed two case studies: one on the socio-economic impact of RSA following improvements to a 50-km, high-class, high-traffic-volume road and the other on the monitoring and assessment of road safety aspects along the Northern Corridor in Kenya also following major road improvements.

## V. ROAD SAFETY AUDIT

Road safety audit is a formal procedure for independent evaluation of the accident potential and likely safety performance of a specific design for a road or traffic scheme, or geometric designs of roads. whether new construction or an alteration to an existing road[Eugene M. Wilson]. The RSA procedures enable the skills of road safety engineering and analysis of accident data to be used for the prevention of accidents on new or modified roads. The use of skills to reduce the occurrence of accidents on existing roads by means of local safety schemes, in many cases in the form of low cost measures.

## VI. STAGES IN RSA

There are five stages in Road Safety, and these steps are as bellow

- a) The feasibility of road stage.
- b) The draft and design stage.
- c) The detailed design stage of road.
- d) The pre-opening stage

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e) An audit is to be done existing road.

The audit of a road is done within the design and development process the better. If an appropriate concept or treatment (i.e. one with inherent safety problems in the particular context) is chosen at the feasibility stage, it is very difficult and, often impossible to remove safety problems at later design stages or once the traffic is using it, early auditing can also lead to early elimination of problems and, consequently, minimization of wasted design time at later stages

## VII. AREA OF STUDY

The Satellite image of proposed area of study and also the original images of original start of project and end locations. We took 12km road for our survey which is start at Sangli Fata, and ends at Sanjay Ghodawat University. The road has 4 lanes, having width 15m.



Fig. 1 Root map of study area

## VIII. PROBLEMS IDENTIFIED

Following problems are observed during survey of Sangli- Kolhapur Highway,

- Deflection
- Rutting
- Failure in pavement

## IX. RESEARCH METHODOLOGY

Benkelman beam deflection method

By using this test we can determine the rebound deflection of a pavement under a standard wheel load and tyre pressure, with or without temperature measurements.

A Benkelman beam apparatus to the Ministry of Works and Development having the dimensions shown on Figure 1. The beam must be prepared with a satisfactory locking device designed to secure the beam when moving to a new site and a suitable vibrator mounted at the pivot point. In sunny weather the beam may be visible to the driver

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in the sunshine. A truck or trailer with an axle load of  $10 \pm 0.15$  tonnes equally distributed on two dual tyred wheels operating at the inflation pressure necessary to give a tyre contact area of  $0.048 \pm 0.0002$  m<sup>2</sup>. The tyres must be preferably 10.00 x 20, 12 ply with tubes and rib treads surrounded.

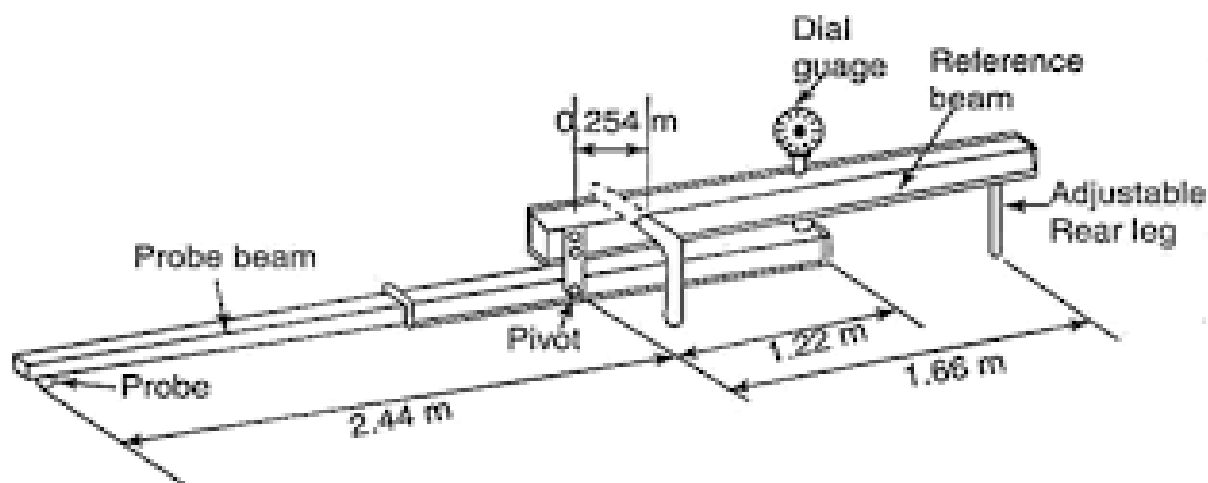


Fig.2 Benkalman beam apparatus

For this test we take a reference of IRC 34 .

### X. RESULTS AND DISCUSSION

TABLE I  
BENKALMAN BEAM DEFLECTION METHOD

SECTION	LANE SIDE	CHAINAGE	CHARACTERSTIC DEFLECTION	TRAFFIC (MSA)	GRANULAR OVERLAY REQUIRED	REMARKS SDBC+DBM+ BC
1	LHS	2.0	1.018	26.88	120	30+50+40
2	LHS	7.7	0.697	26.88	90	50+40
3	RHS	4.3	1.078	26.88	120	30+50+40
4	RHS	11.5	1.559	26.88	140	50+50+40

### XI. CONCLUSION

- For 1<sup>st</sup> section (SGU-Atigre)-Provide bituminous concrete of 40mm thickness over DBM course of 100mm.
- For 2<sup>nd</sup> section (SGU-HERLE)-Provide bituminous concrete of 40mm thickness over DBM course of 60mm.
- For 3<sup>rd</sup> section (Sangli Fata-Male Fata)-Provide bituminous concrete of 40mm thickness over DBM course of 100mm.
- For 4<sup>th</sup> section (Sangli Fata-Raj Hotel)-Provide bituminous concrete of 40mm thickness over DBM course of 100mm.

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- The analysis has indicated that the most severe accident prone locations are KM 0 to 1, KM 2 to 3 and KM 1 to 2. These stretches needs geometric improvement, pavement resurfacing etc .

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