Road Safety Audit

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Abstract— **Now a day, in every 10 minutes, one human life is lost due to road crashes. In the world, India has world's largest heavy traffic and accidents also. It is necessary to provide the safety to roads. Road Safety Audit (RSA) is a procedure or method in which identification of existing or future road on basis of safety issues and provision of safety remedial measures on it.**

In this study, the section of road from "A.T.E.S. Faculty of Polytechnic, Akole to M/S. R. V. Traders Godown, Shekaiwadi (K.G.Road SH 44)" is undertaken. Road taken having considerable traffic during day time and some black spots on the road where accidents takes place continuously. A detailed analysis of road from "Agasti College, Akole to M/S R.V. Traders, Akole" is carried out on the basis of data collection like traffic volume study, accidental data collection, potholes on road data collection, road safety signs and symbols, questionnaire survey of public, etc.

The aim of study is the inspecting the road in the terms of the safety measures, road scenario, any type of flaws and to suggest the mitigative and preventive measures for the selected section of road for audit.

Keywords— Road safety, accident, potholes

I. INTRODUCTION

Road is a way or route between the two or more places connected for travelling and transportation of human, goods, etc. by vehicles like motorcycles, buses, trucks, tempos, cycles, i.e. 2 wheelers and 4 wheelers.

In the year 1943, the conference of Chief Engineers of Central and state governments of India, at Nagpur, conveyed by the central government, make a equalized system of plan of road development for India called 'Nagpur Road Plan' by Indian road Congress (IRC). According to it, it is classified as-National Highway (NH), state Highways (SH), Major District Roads (MDR), Other District Roads (ODR), Village Roads (VR). India having 5.5 million km road network which is 2nd largest in the world. Road transportation is the only one mode of transportation which gives maximum services. Ministry of Road Transport and Highways (MORTH) of India have taken up the responsibility of building good quality roads and highways inside the country. According to year 2016-17, 16,271 km of NH were decided to construct and 8,231 km were constructed. In 2016-17, MORTH constructed the 22 km highway per day. They sets target of 40 km of highway per day by financial year 2017-18. On 31st March 2016, India has 2nd largest road network of over 6,603,293 km in the world. Every hour 16 peoples were died by road accidents on Indian roads that mean 1 death occurs in every 5 minutes. According National Crime Record Bureau (NCRB) report of year 2015, 53 road accidents occurred every hour, wherein 17 persons were killed. It is necessary that the roads constructed or which are to be constructed in future were according to proper design, measures to be taken for accident prevention, provision of safety signs and symbols, proper road markings, etc. and providing better access to services, ease of transportation and freedom of movement to people.

II. LITURARURE REVIEW

This section literature review different methodologies taken in research work done by different researchers.

Some researchers (Sanjay Kumar Singh 2017), (Murat Gunduz 2018), (Rahul Goel 2018), (Hitesh Kumar 2017), (Shalini Kanuganti 2017) (Abdul Rahoof 2017) have investigated accident injury severity suggest measures. (Athanasios Galanis 2017), (Dinesh Mohan 2017), (Francis John Gichaga 2017), (Luca Persia 2016) have studied tyepes of roads and asses the road safety management and schemes for road improvement. (Lorenzo Domenichini 2018) studied the urban road safety on vehicle speed reduction.

Most of the studies are based on methods of assessment of road accidents. Their study includes accident data as main element of the research. Generally, Road safety Audit's methods improve the understanding of the safety performance of roads, they all require accident data. But there is a lack of data like Pothole data collection of roads. Road traffic accidents increases due to potholes on the road cause the traumatic spinal injuries, bones injuries, etc. After studying various review paper we have found that the main aim of road safety audit is to assure that all new road schemes operate as safely as practicable. This means that safety should be considered whole cycle of design, construction and preopening of any project facility and also during operation & maintenance of the highway.

III. PROBLEM STATEMENT

From above literature review following uncertainties like gap in study of role of bad roads in accidents is identified. Hence the further project works aims to study the Road Safety Audit (RSA) from the traffic engineering and analysis of it as per new definition of bad road by Hon. Bombay High Court. And final aims to suggest preventive and mitigative measures for the same.
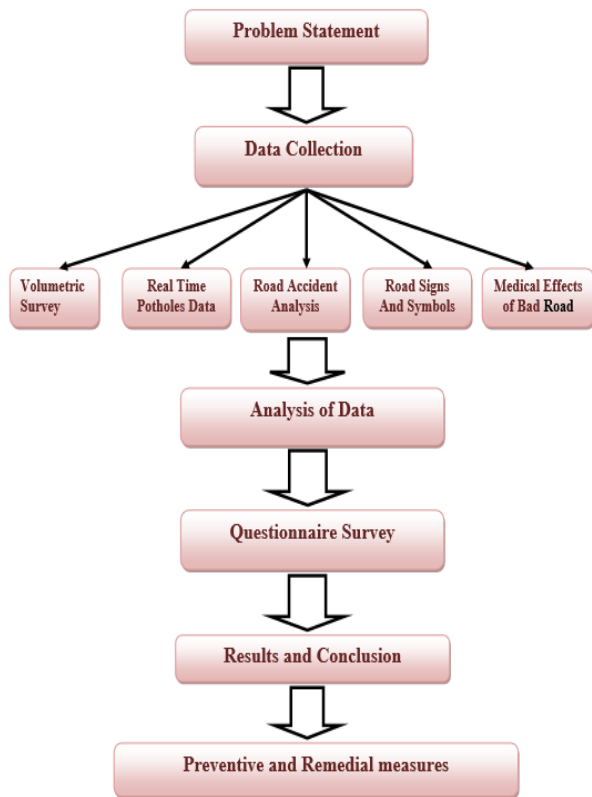
IV. OBJECTIVES OF PROJECT

1) To understand the Road Safety Audit (RSA).
2) To inspect the road in the terms of the safety measures, road scenario, any type of flaws.
3) To study the section of road from A.T.E.S. Faculty of Polytechnic, Akole to M/S. R. V. Traders Godown, Shekaiwadi (K.G.Road SH 44).

4) To suggest the mitigative and preventive measures for the selected chainage of road for audit.

V. METHODOLOGY

Every work has a specified methodology. Safety Audit can be taken on new roads, existing or constructed roads. For carrying out Road Safety audit of the given section of road following methodology is adopted-

3) Variations of vehicles flow on different parts of a road junction.

Fig. No 1
Methodology Of Work

VI. DATA COLLECTION

A. Traffic Volume Study

It is the survey of number of different vehicles crossing a section of road per unit time during selected period. Study is done at selected point called as count posts or traffic count stations. A complete traffic volume study includes the classification and types of vehicles moving on road which are left going, straight going or right going and class of traffic. This study of traffic volume helps to understand –

1) Hourly, daily, yearly and seasonal traffic volume variations.

2) Volume and direction of traffic

4) Proportion of cars, heavy vehicles, and slow vehicles on different parts of a road junction.

a. Volume flow diagram at a road intersection

It is the numerical representation of traffic giving the details of crossings and turning traffic.
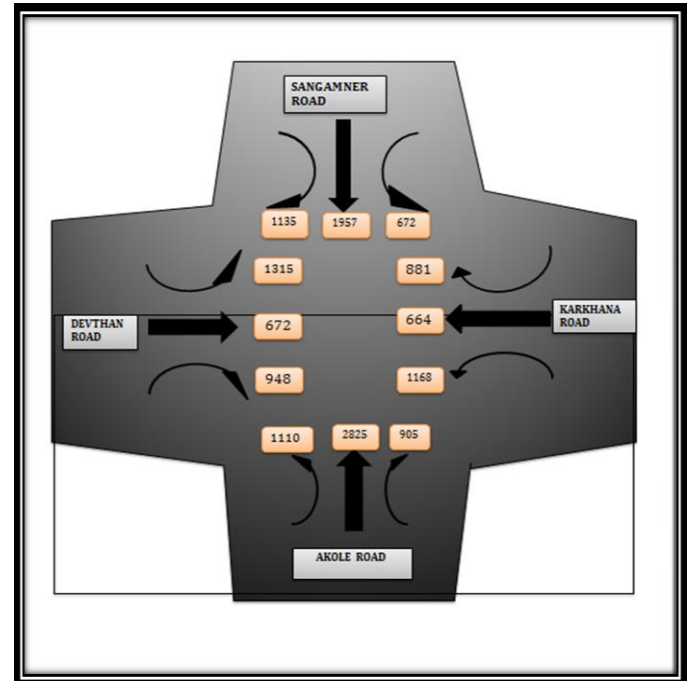

Fig. No2 Traffic Volume Diagram At A Road Intersection At Mahatma Phule Chowk, Pravara Corner, K.G. Road, Akole

Table No.1 Traffic Volume During **Peak Hours** At A Road Intersection At Mahatma Phule Chowk, Pravara Corner, K.G. Road, Akole

TIME	TYPE OF VEHICLE	NO.OF VEHICLES
FROM 9 A.M. TO 12 P.M.	BUS	98
	CAR	960
	TRUCKS	152
	2 WHEELER	7974
	3 WHEELER	197
	TYRE CART (SUGARCANE)	106
	TOTAL	9487

Table No.2 Traffic Volume During **Normal Hours** At A Road Intersection At Mahatma Phule Chowk, Pravara Corner, K.G. Road, Akole

TIME	TYPE OF VEHICLE	NO.OF VEHICLES
FROM 12 P.M TO 2 P.M.	BUS	47
	CAR	491
	TRUCKS	78
	2 WHEELER	4204
	3 WHEELER	96
	TYRE CART (SUGARCANE)	205
	TOTAL	5121

B. Real Time Potholes Data Collection

A pothole is a structural defect in a road surface, caused by failure preliminary in asphalt pavement due to the availability of moisture content or water in the subsoil strata and traffic intensity over affected road area. Presence of water content weakens the supporting soil of road.

Table No. 3 Potholes Data Collection of Selected Chainage Of Road

Potholes size in (cm)	No. of potholes
0 to10	9
10 to 20	33
20 to 30	84
30 to 40	89
40 to 50	46
50 to 60	58
60 to 70	47
70 to 80	48
80 to 90	42
90 to 1m	38
1 to 2m	62
2 to 3m	14
3 to 4m	9
4 to 5m	3
Above 5 m	6
Total	588

C. Accident Data Analysis

Table No. 4 Accident Data By Akole Police Station

Sr. No	Year	Type Of Road	Black spot Name	No. Of Deaths/ Year	No. Of Injuries/ Year
1	2014	SH, MDR, ODR, VR	Navalewadi Road, Khanapur Road, Gardani Road, Kotul Road, Virgaon Road, Keli-Kotul Road	9	5
2	2015		Samsherpur Road, Vashere Ghat, Bhramhanwada Road, Devthan Road, Nimbral Road	13	12
3	2016		Kotul Road, Devthan Road, Bhramhanwada Road, Tambhol Road,Muthalne Road	10	5
4	Upto August End 2017		Sugav Phata,Manoharpur, Phata, Samsherpur Road,Indori Phata, Bhramhanwada Road, Devthan Road, Ambad	15	13
Total				47	34

D. Medical Effects Due To Bad Road Condition

Road Traffic Accidents (RTA) has suggested an important public health issue. In India, RTA injuries, deaths, fatal injuries, body damages are increased. It is required to stop road accidents, which causes medical hazards to human body. There is need of strict implementation of on it to overtake on public health issue.

We gain the data related to injuries due to bad road condition and potholes from Civil Hospital, Dhanvantari Clinic, and Sadaphule Accident Hospital. By observing report given by them we get information about injuries. Due to bad road conditions, diseases like Cervical Spondylitis, Backache, Sciatica, injuries of knee, shoulder etc. was occurred.

E. Questionnaire Survey

It is the method of collection of data by public in a structured form, either written or printed, consists of a formalized set of questions designed to collect information on some subject or subjects from one or more respondents.

After doing the questionnaire survey, we got bad replies from the peoples. Public was upset on PWD and local authorities regarding repairing work and regular or required maintenance of road.

F. Road Signs And Symbols

The various devices used to control, warn, regulate and guide traffic called as traffic control devices. General requirements of traffic control devices are:

1) Signals
2) Signs
3) Making
4) Island

In addition, road light are useful in guiding traffic during night. The traffic signs should be backed by law in order to make them useful and effective traffic signs have been divided into three categories according to Indian Motor Vehicle Act. These are:

1) Regulatory Signs 2) Warning Signs 3) Informatory Signs

The signs should be provided such that they could be seen and recognized by the road users easily and in time. The size, shape, color code and the symbols used and the symbols and the location signs should be as specified under each category. The reverse side of all signs plates should be painted grey.

After surveying selected chainage of road during day and night time, there are no provision of safety signs, symbols, road markings, street lights, etc. Many accidents are occurred due to insufficiency of guidelines on the road. There is need of provision of it on road.

VII. RESULT AND CONCLUSION

From above study work and analysis of collected data, expert reviews, Questionnaire survey, following conclusion can be drawn-

1. The continuous contact with potholes present on the road leads to major effects on the human health like back pain, etc. No. of accidents are increases day by day. Due to the potholes damage to human body and motorist's vehicle.

2. It found that Road Markings, Condition of Shoulder, Traffic Volume, Spot Speed, improper drainage arrangement were main parameters for causing accidents.

3. As per experts like engineer, orthopedic surgeons the road section from "Agasti College, Akole to Ms. R. V. Traders Godown, Shekaiwadi (K.G.Road SH 44)" reaches the severe level.

4. Absence of road informatory signs, regulatory signs boards, and road markings adds into seriousness of the problem for given chainage of the road.

5. Hence, as a cumulative impact of above conditions, the road users safety is compromised and may points leads to accident prone areas like Navalewadi Phata, Pravara Corner, Agasti High school, Shampro office, Sheakaiwadi.

6. There is no utilization of road efficiency. Hence it affecting day to day life of road users.

7. Hence there is necessity of particular remedial measures without delay. Ground zero action is necessary. Improving safety on a given segment of roadway is rarely a simple process. As traffic grows, additional development occurs, and the pace of life in modern society increases, this task is even more challenging Everyone who used the road are committed to improving the safety of streets and highways are to be commended for their efforts to improve transportation safety for all roadway users.

VIII. REMEDIAL AND PREVENTIVE MEASURES

Some remedial and preventive measures provided on the basis of the road from "Agasti College, Akole to Ms. R. V. Traders Godown, Shekaiwadi (K.G.Road SH 44)" taken for the study-

1. Carry out regular or needy maintenance and markings of road safety signs.

2. Provide proper footpaths for pedestrians and pedestrian crossings at intersections.

3. Road and junction should be wide and well lit so that visibility is good.

4. Provision of street lights on given section of road.

5. All unauthorized median openings should closed and adequate provisions for crossing local people be made on priority.

6. Parking on the road is should be as per traffic rules.

7. Carry out regular repairs and maintenance of the road.

8. Traffic safety awareness programs should arrange and implemented strictly to public. Strict action must be taken for violation of traffic rules.

9. There should be transparency and all driving tests should carry out while giving license to people. So as to avoid accidents, destructions, etc.

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